

Western Regional
Climate Center



The Need for Regional Climate Observation Networks



Kelly T. Redmond

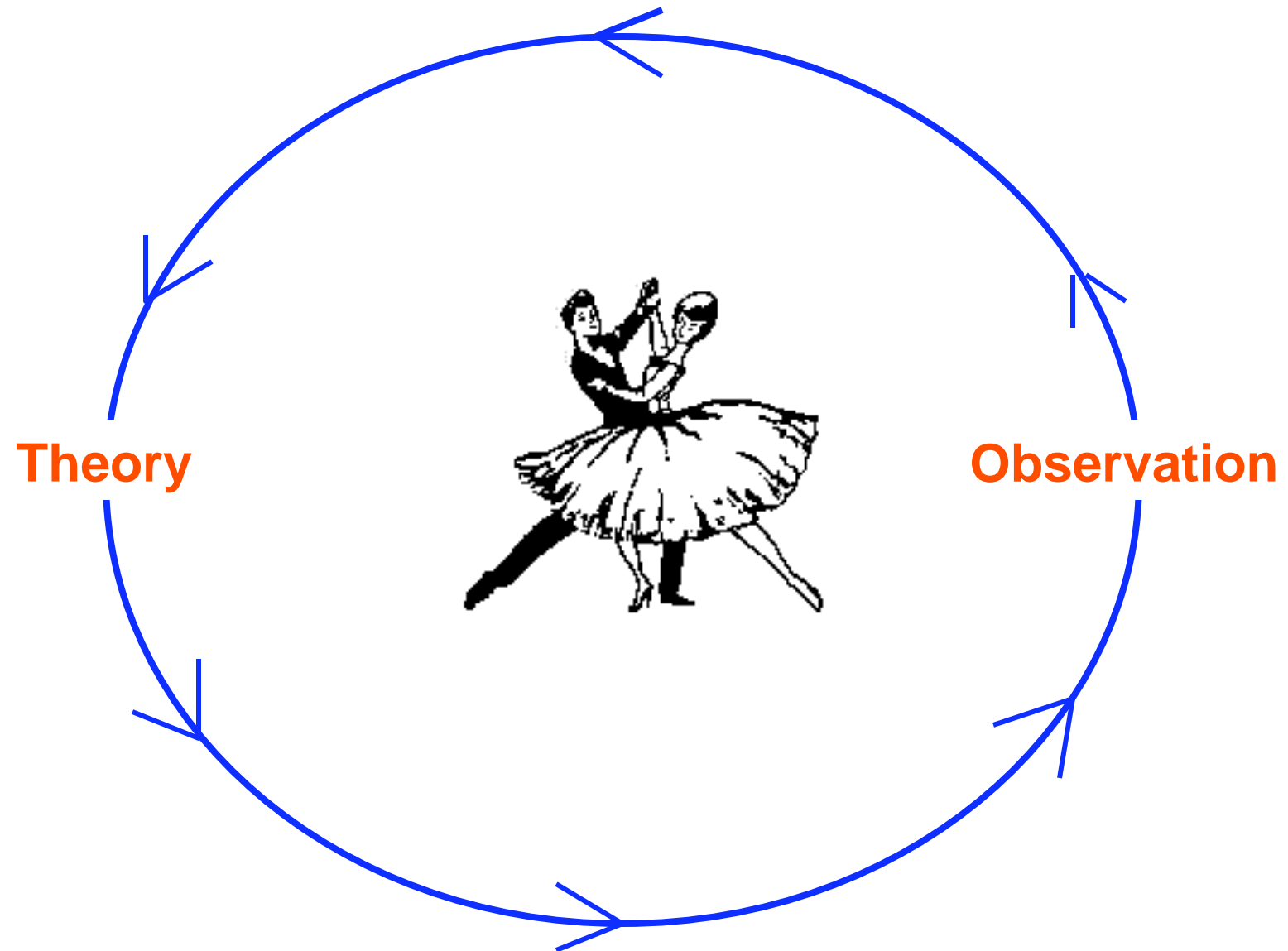


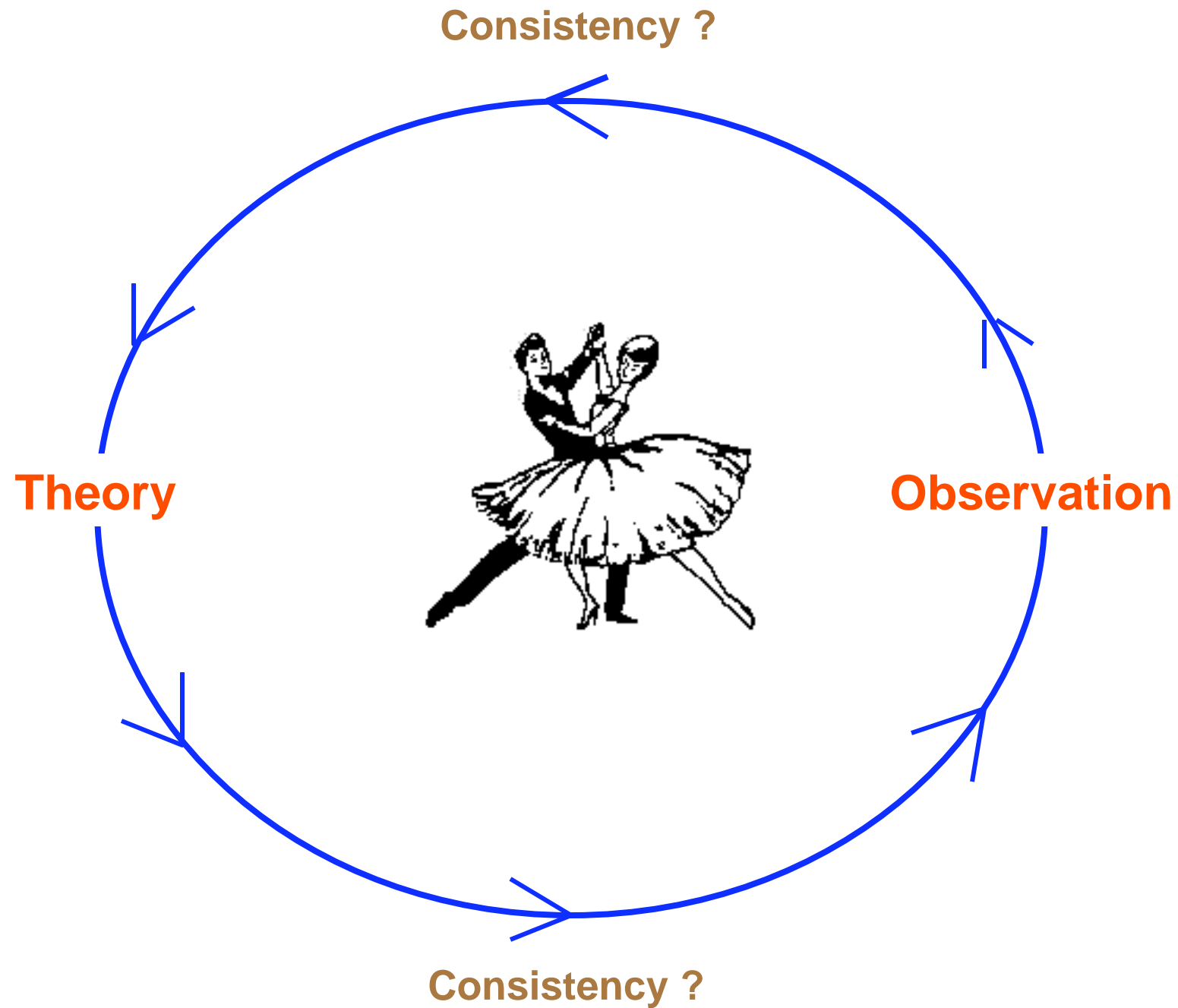
Western Regional Climate Center
Desert Research Institute
Reno Nevada



6th Annual California Climate Change Symposium
Sacramento California 2009 September 8-10
Sponsors: CEC, NOAA WRCC, NOAA CAP







Why do we monitor climate ?

Refine our knowledge about spatial variability of climate

Refine our knowledge about temporal variability of climate

Refine our knowledge about spatio-temporal variability of climate

Learn ties between regional/local spatial scales and global/continental

Learn ties between regional/local temporal scales and global/continental

Downscaling and detailed gridding (e.g., PRISM)

Need observations at the downscaled level

Explanation of behavior of other systems

Climate (physical environment) as a complete or partial driver

Verification of predictions

Validation of models

Retrospective detection and explanation of climate-influenced events

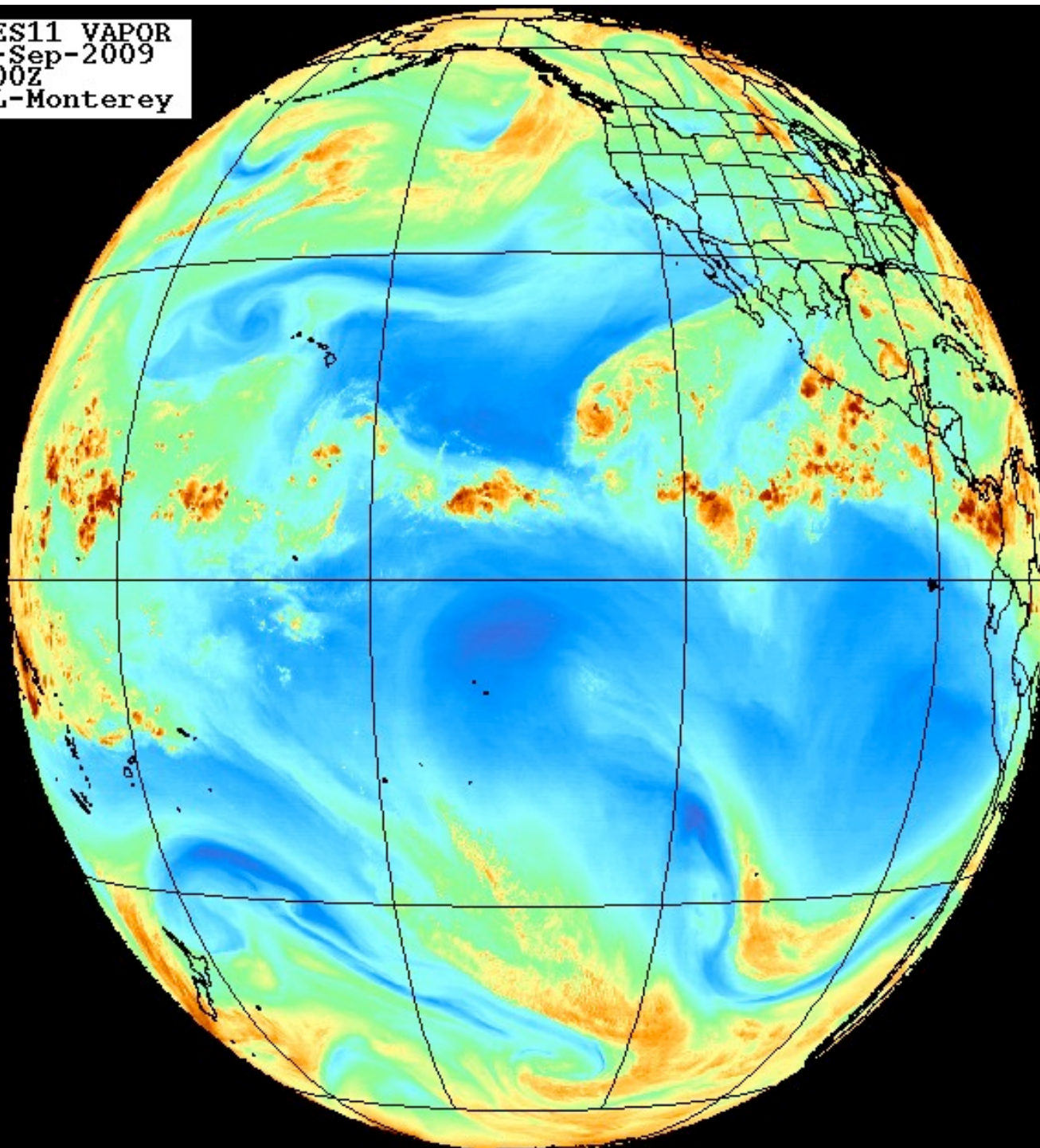
Quantification of subjective impressions

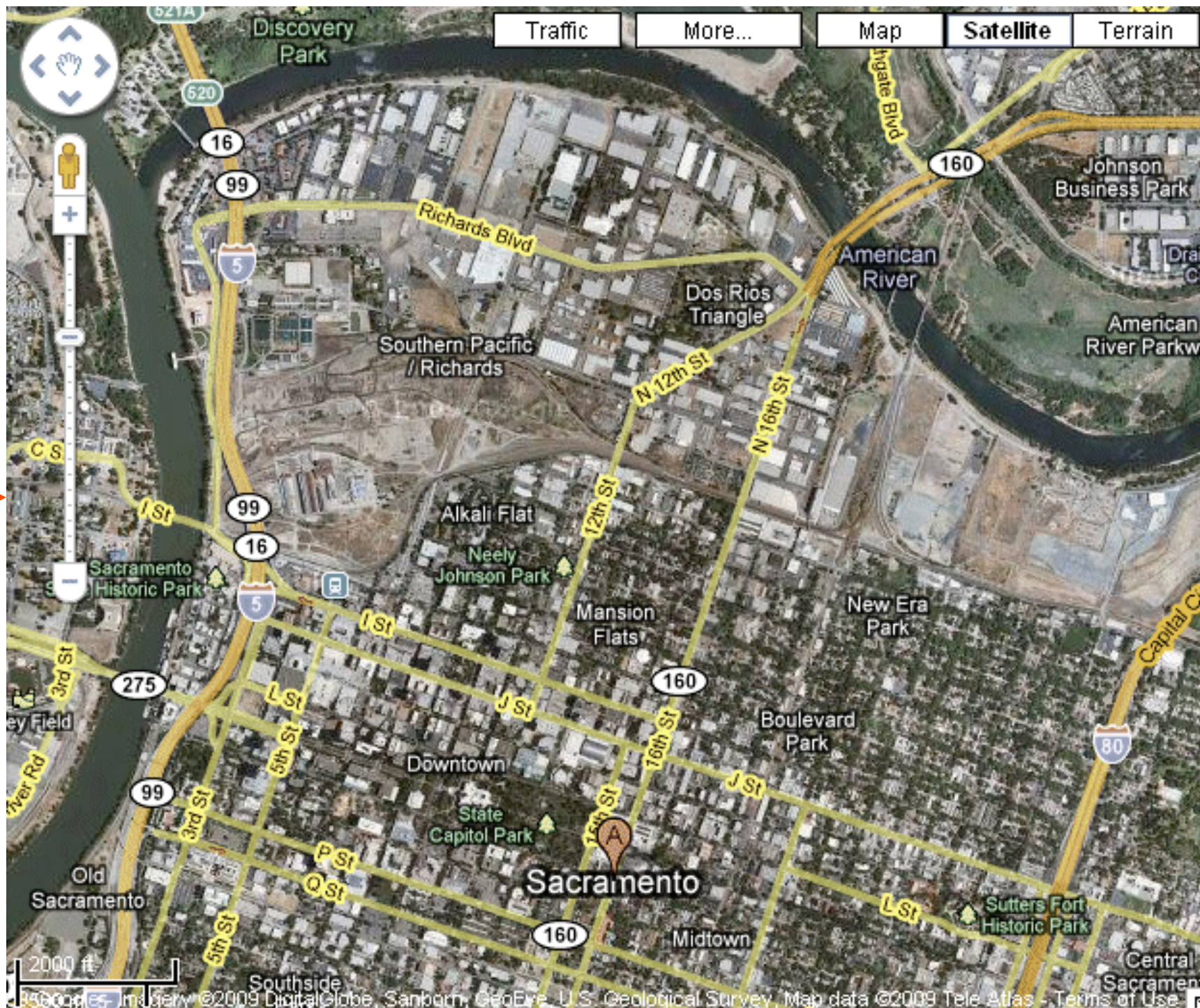
Adaptation needs

Discovery of emergent phenomena

Surprise!!! We've never seen THAT before !

GOES11 VAPOR
08-Sep-2009
1800Z
NRL-Monterey





Strategy

We would like to know

Everything

Everywhere

All the time

Can't do that?? What's next?

Uniform versus non-uniform sampling?

What will provide the most new information?

Transects across gradients

Clusters at scales of interest

Assumed replicability (most mountains are like each other)

Live data

Immediate

Participatory

Much more interesting

Don't have to back-remember

Practicality: Attract a diverse constituency, be of use, stay functional

Why regional ?

The whole state does not act as one monolithic climate block

Spatial correlation patterns vary during the seasonal cycle

They also vary differently through the seasons by element

Temperature (Tmax, Tmin, Tave)

Precipitation

Biggest areas of regional and local sub-structure

Natural

Mountains

Coast

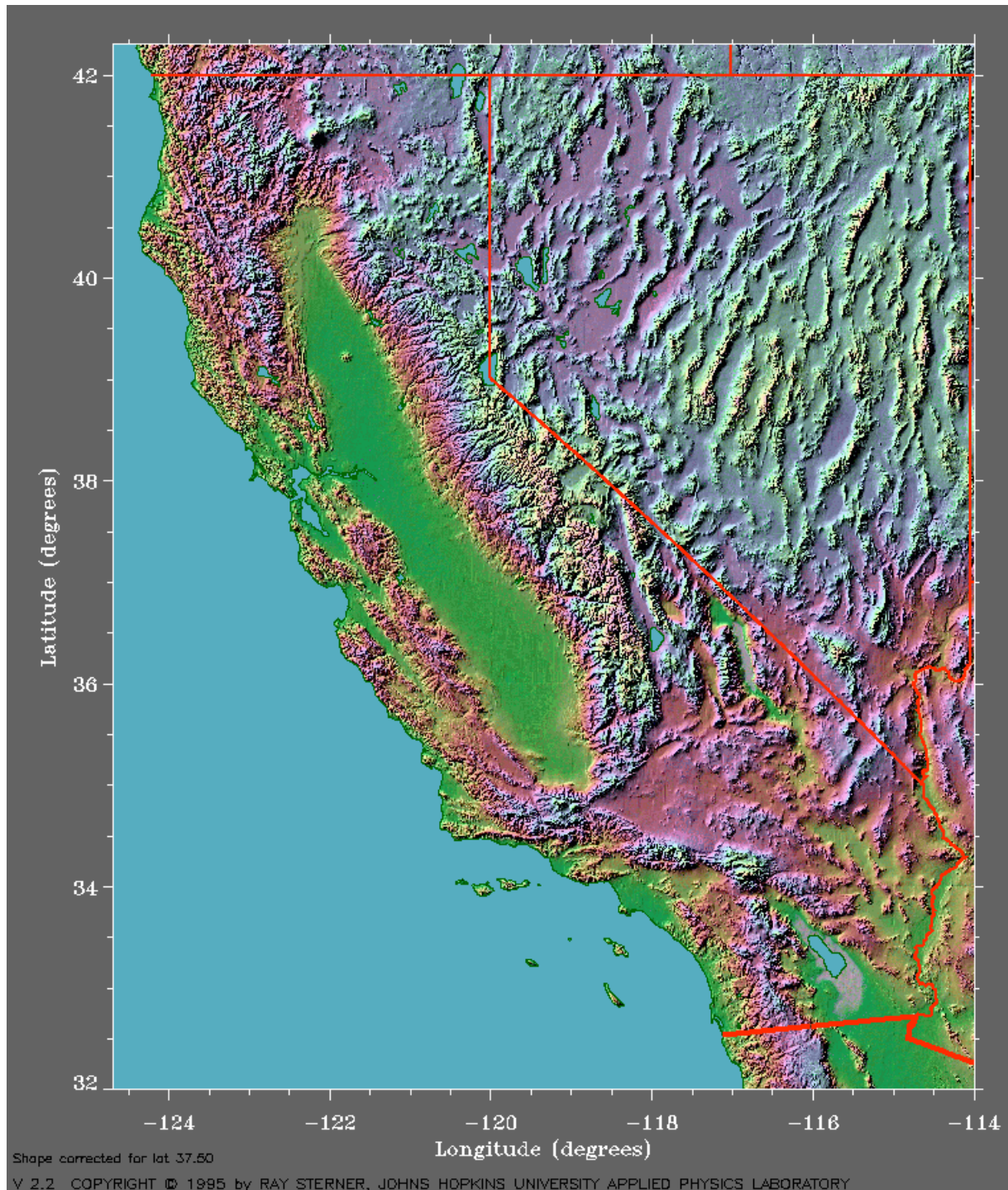
Human-induced

Urban vs Rural

Irrigated vs Non-irrigated

Climate is generated globally, regionally, locally
but

Climate is experienced in My Back Yard



California

Size

158,000 sq mi

10 degrees of latitude

Geographic and Climatic Complexity

-282 ft to +14,495 ft

2-160 inches precip

California Climate Data Archive

A collaboration among Western Regional Climate Center, Scripps Institution of Oceanography & California Energy Commission

[HOME](#) | [Data & Products](#) | [Monitoring & Forecasts](#) | [Related Research](#) | [Links](#)

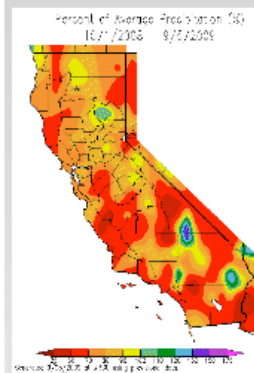
[About Us](#)

[Project Partners](#)

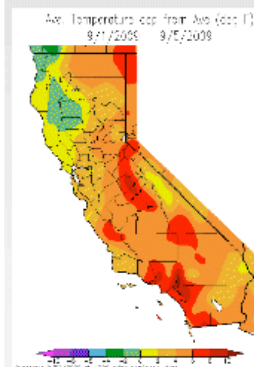
[Contact Us](#)

[What's New](#)

Daily Updated Climate Maps:



October 1-to-date Percent of Average Precipitation



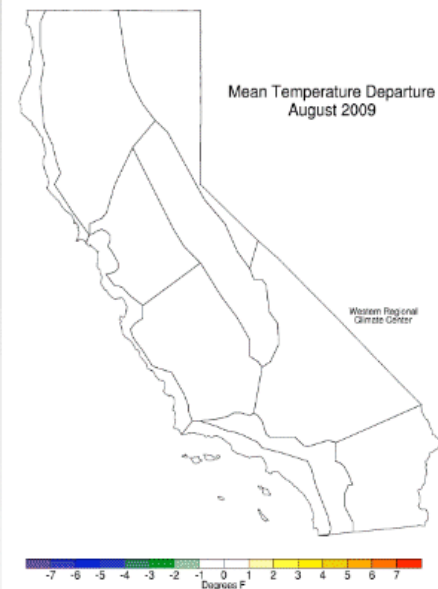
WELCOME to the California Climate Data Archive! CalClim is a climate monitoring and data access website for the state of California. This website is sponsored by the [California Energy Commission](#), and is a joint effort between the [California Climate Change Center](#) at Scripps Institution of Oceanography and the [Western Regional Climate Center](#) at Desert Research Institute.

We serve as a data archive for several weather and climate networks in California. See the [Data & Products](#) page for more details and data access. Visit the [Monitoring & Forecasts](#) page for regularly updated products, including the popular [Climate Anomaly Maps](#) that are updated daily. These maps serve as a first look at temperature and precipitation across the state for several timescales. [Related Research](#) will bring you to a page to learn more about other climate research related to California and the western US. Visit the [Links](#) page to find more information about weather, water and climate in general.

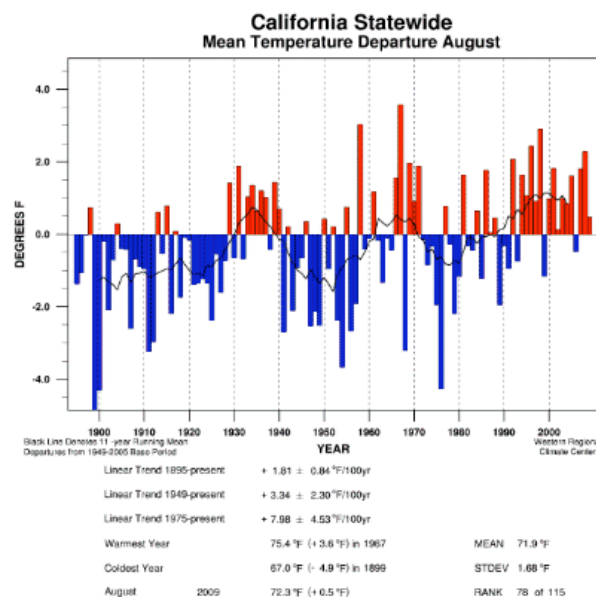
New Highlights:

CALIFORNIA CLIMATE TRACKER: California climate history through last month

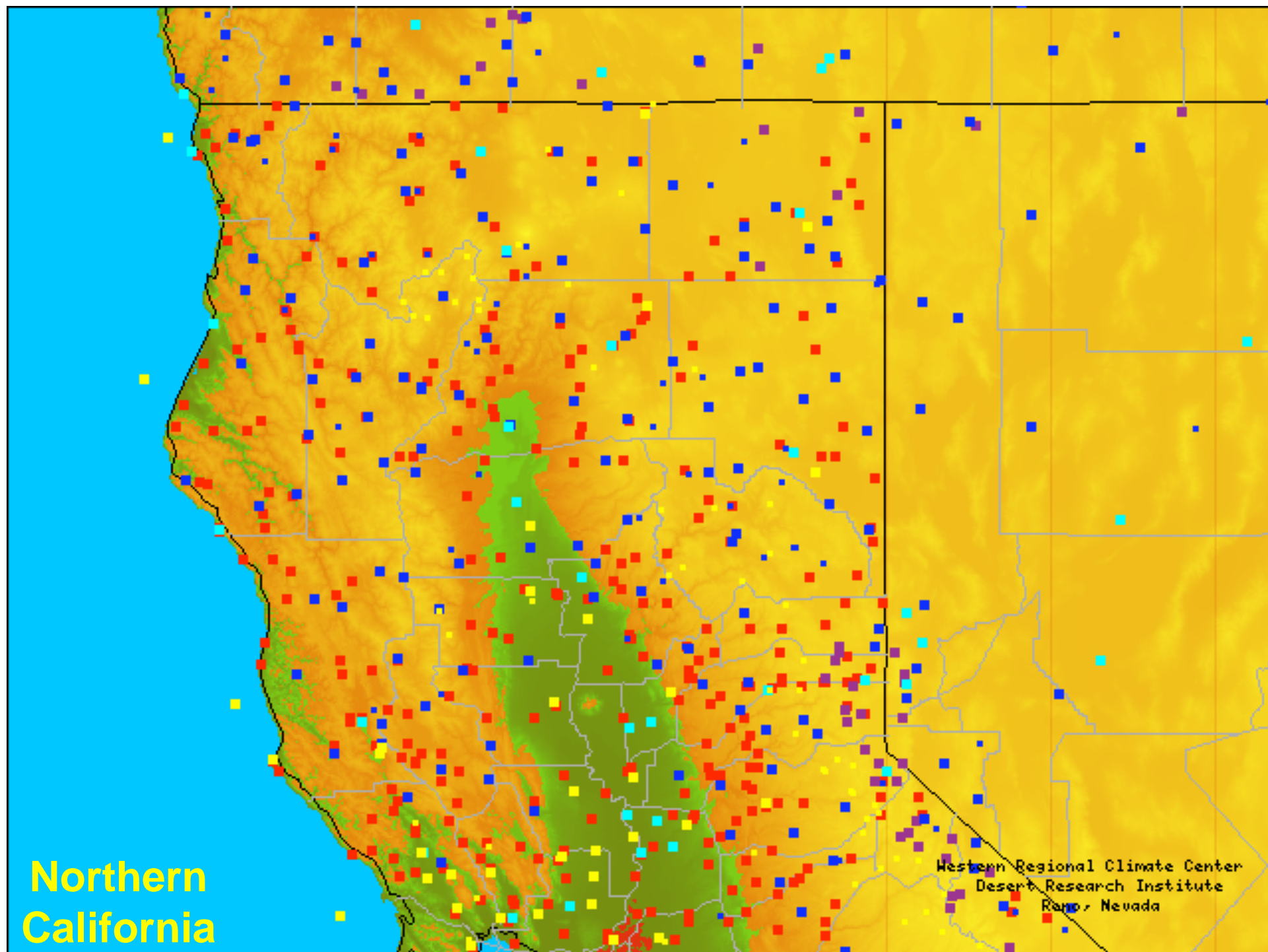
- Monthly updates of California temperature and precipitation
- View climate trends, maps and time series by climate region, or statewide
- Uses station-based and gridded climate data

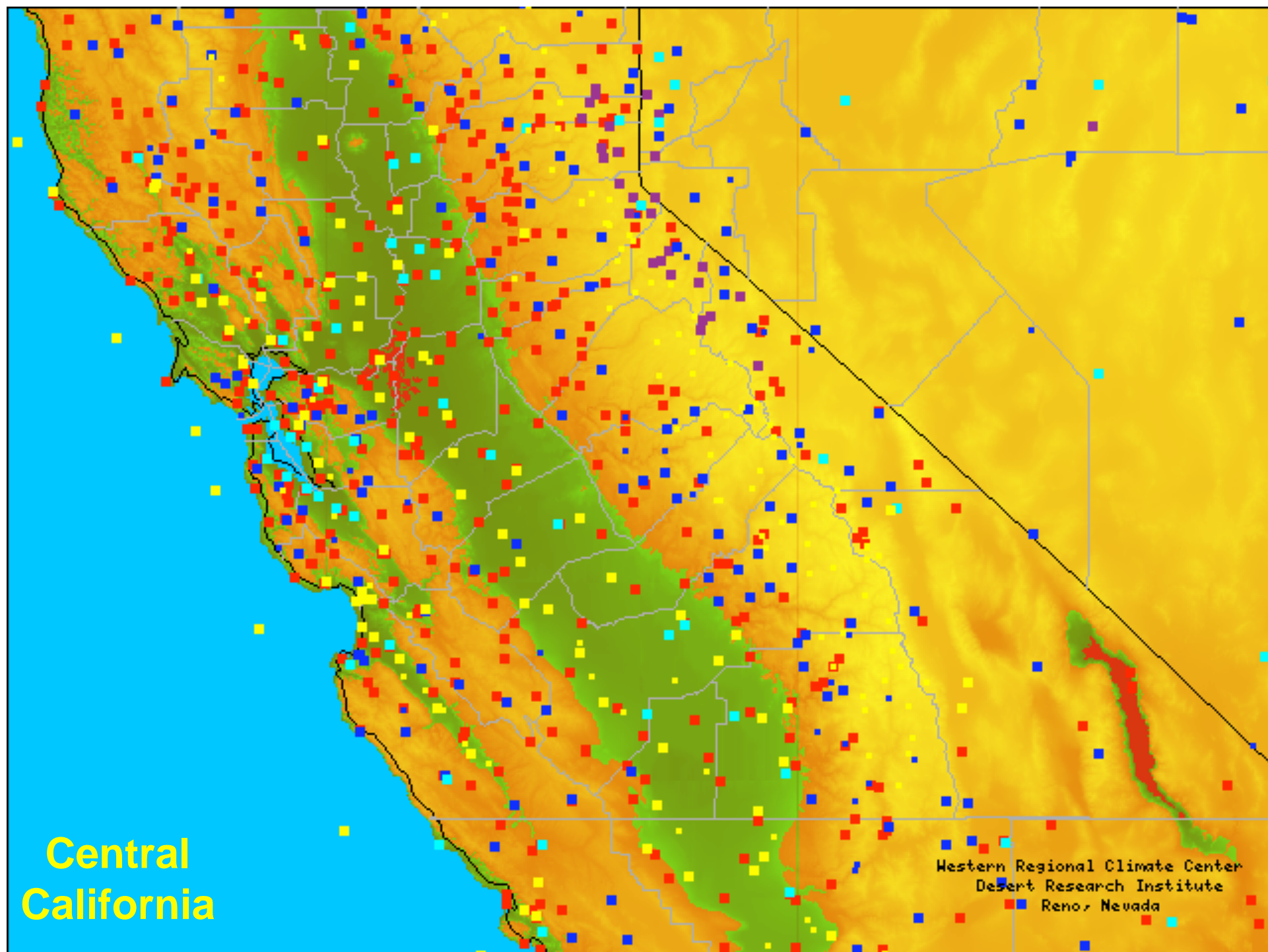


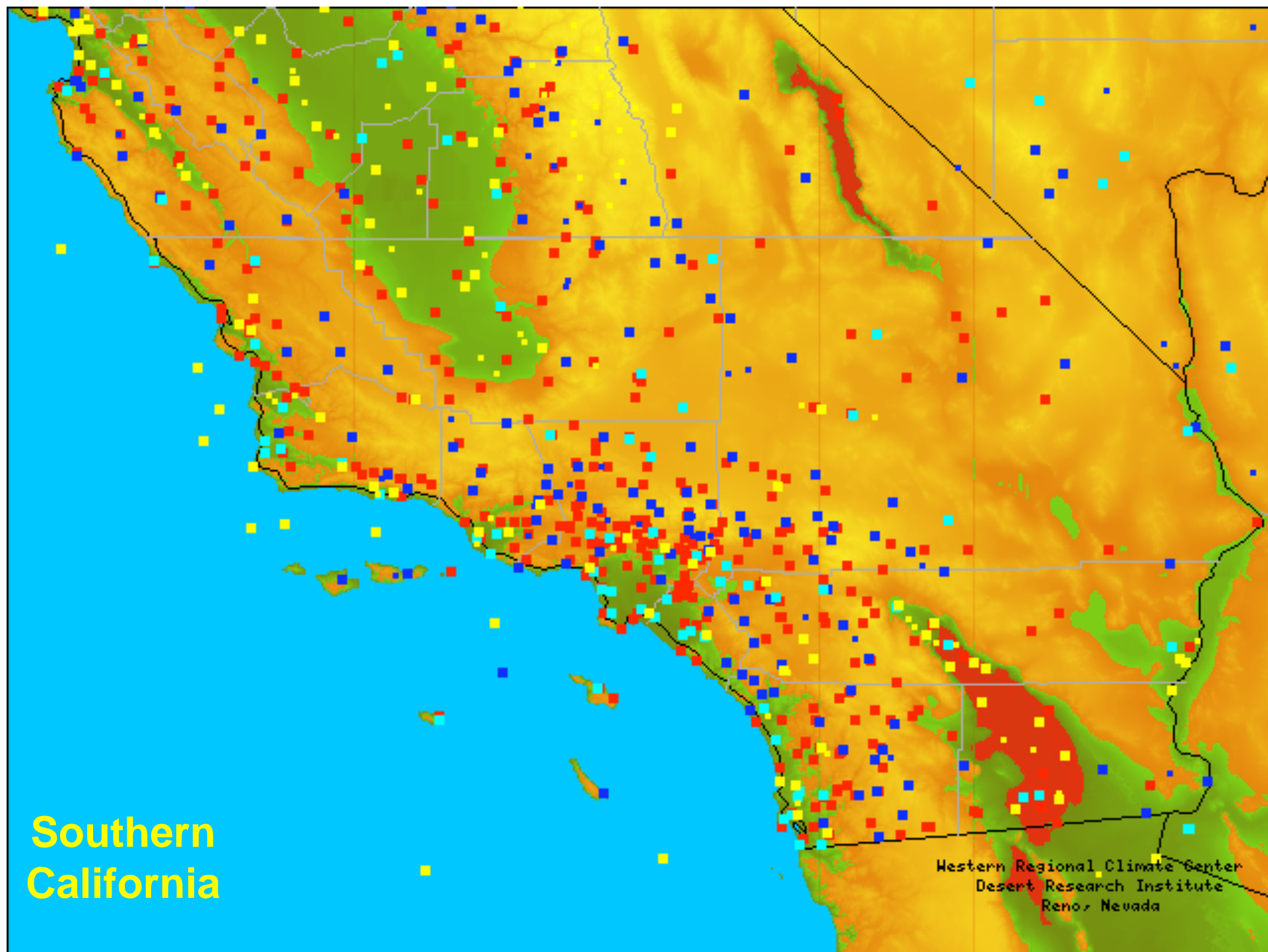
Visit [this link](#) to view more climate histories!



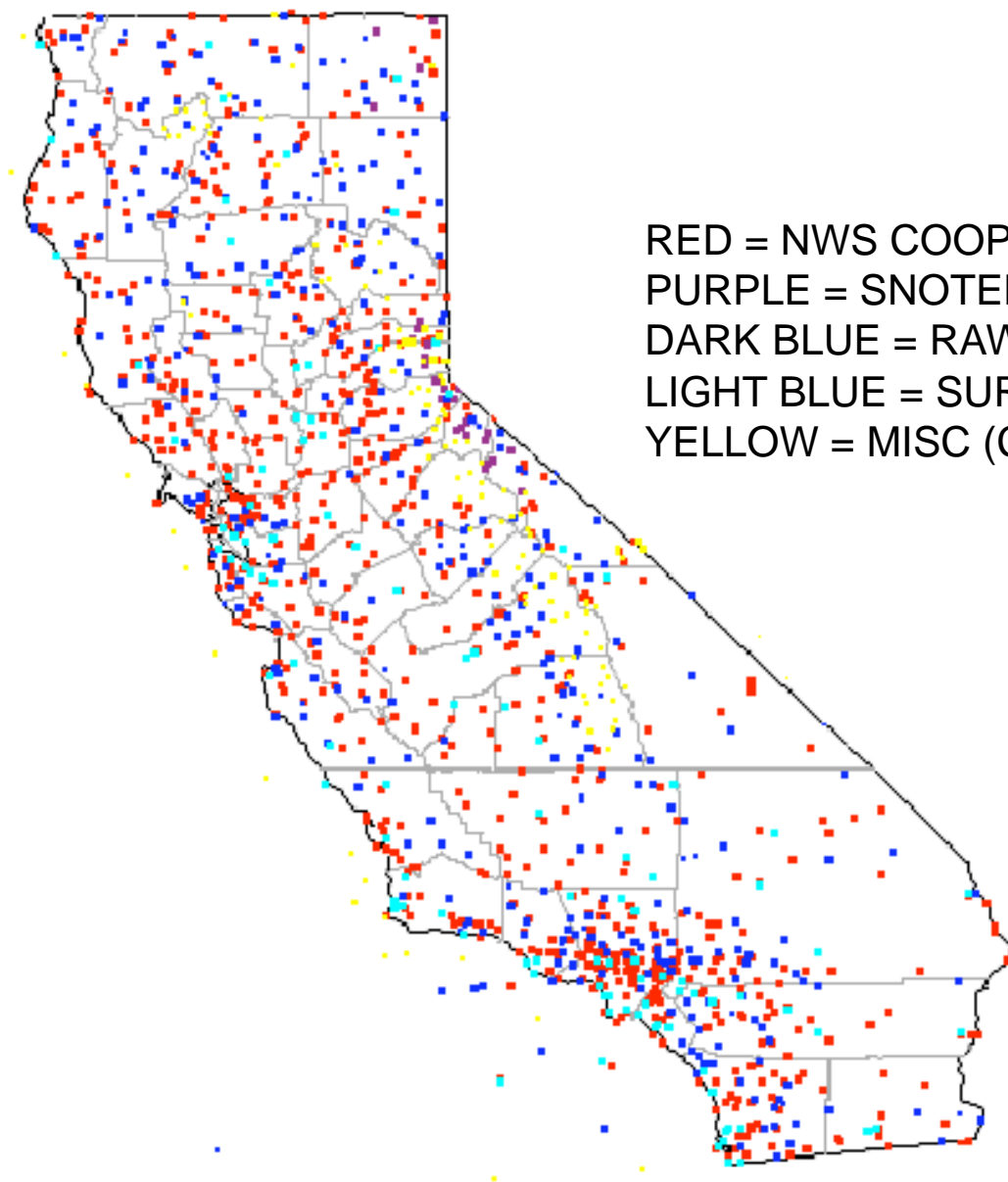
calclim.dri.edu







Current Stations



RED = NWS COOP

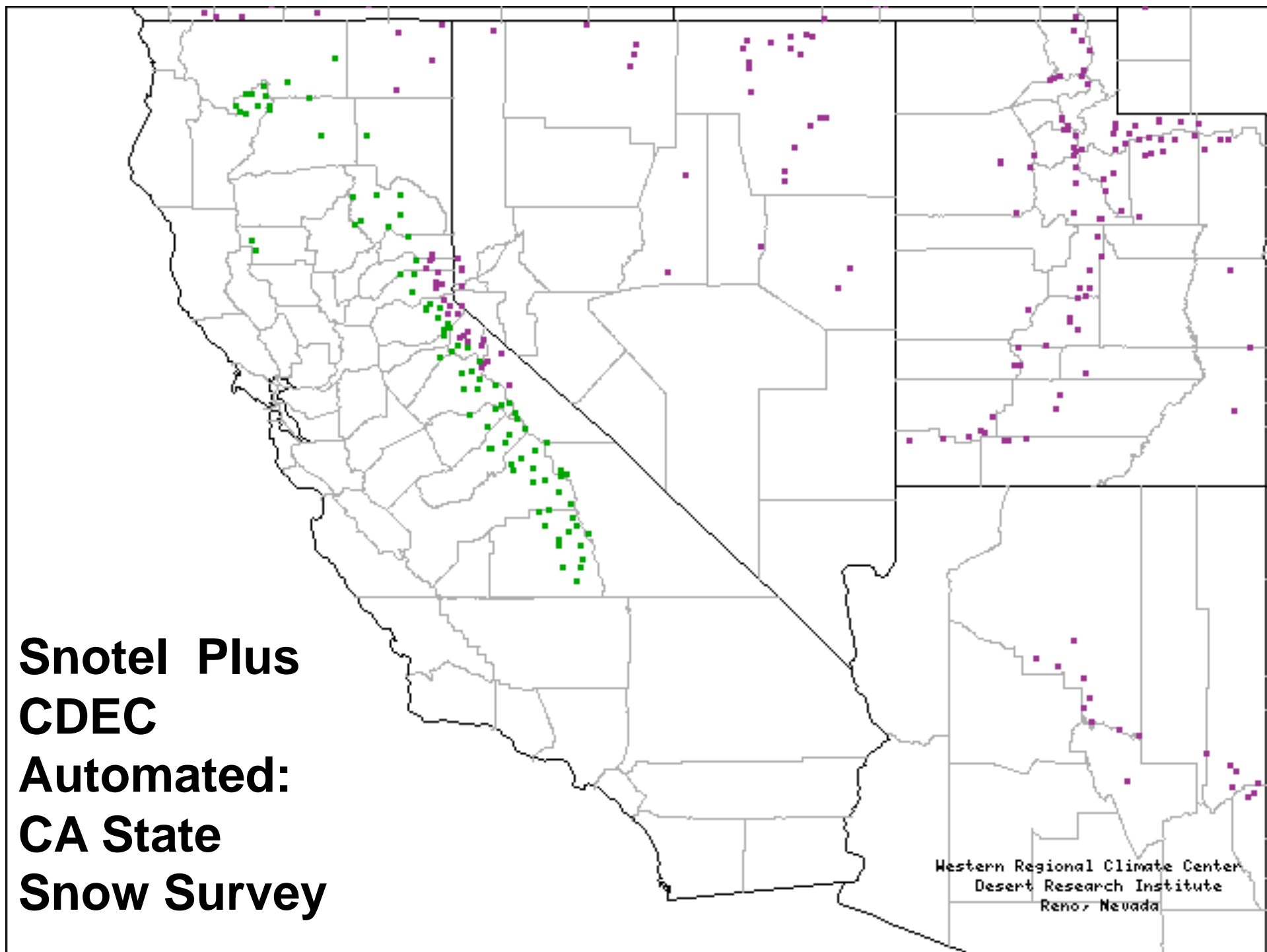
PURPLE = SNOTEL

DARK BLUE = RAWS

LIGHT BLUE = SURFACE AIRWAYS

YELLOW = MISC (CURRENTLY CIMIS, CDEC, BUOYS)

**Snotel Plus
CDEC
Automated:
CA State
Snow Survey**



Western Regional Climate Center
Desert Research Institute
Reno, Nevada

Coasts in the United States

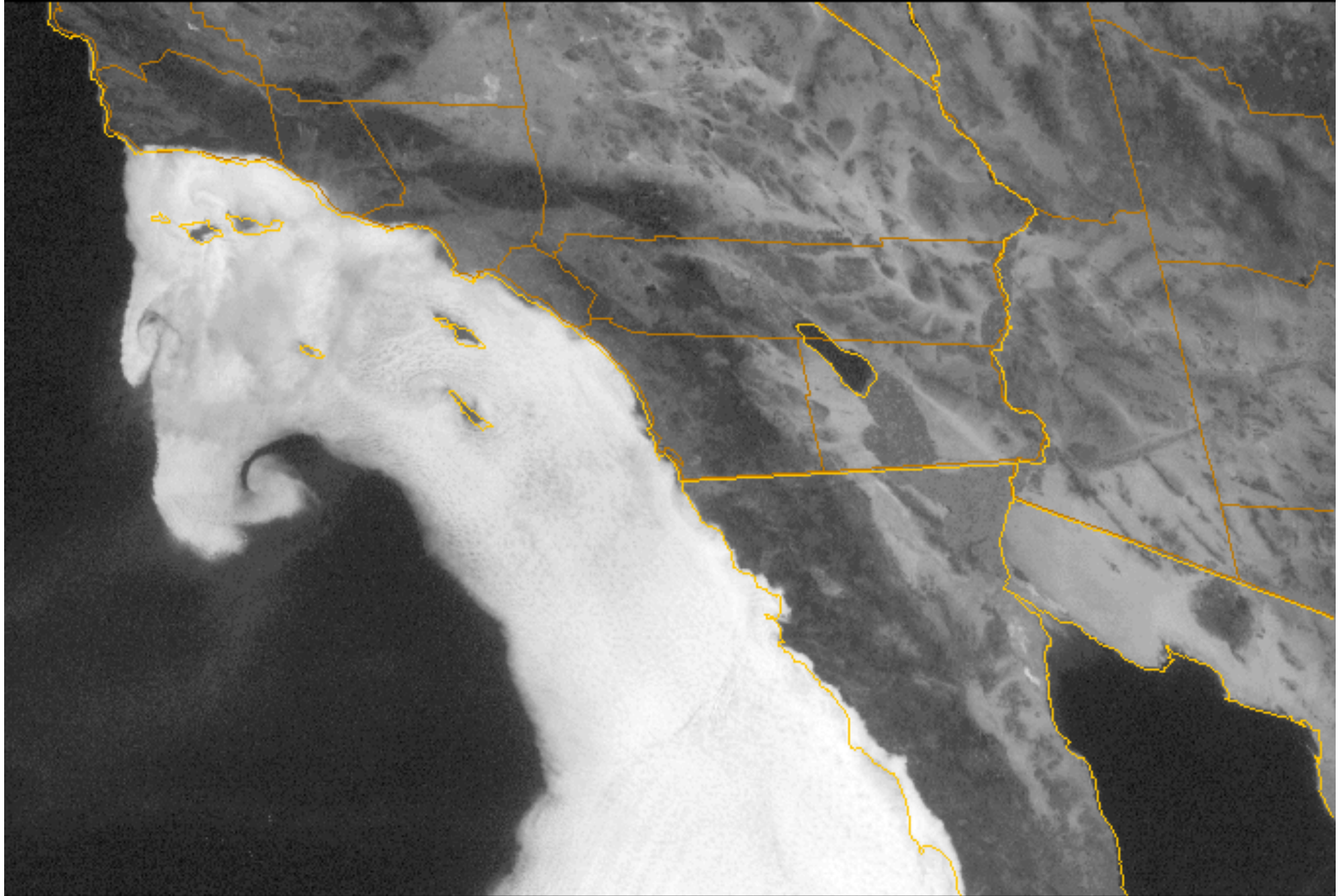
	<u>Low resolution</u>	<u>Details to 100'</u>
California	840	3427 miles
WA,OR,CA	1293	7863
Hawaii	750	1052
Alaska (Pacific)	5580	31383
Pacific	7623	40298
Atlantic	2069	28673
Gulf	1631	17141
Arctic	1060	2521
Total US Coast	12383	88633

“How long is the coast of Great Britain?” problem – scaling and fractals

Source: National Ocean Service, infoplease.com. Details 1939-40.

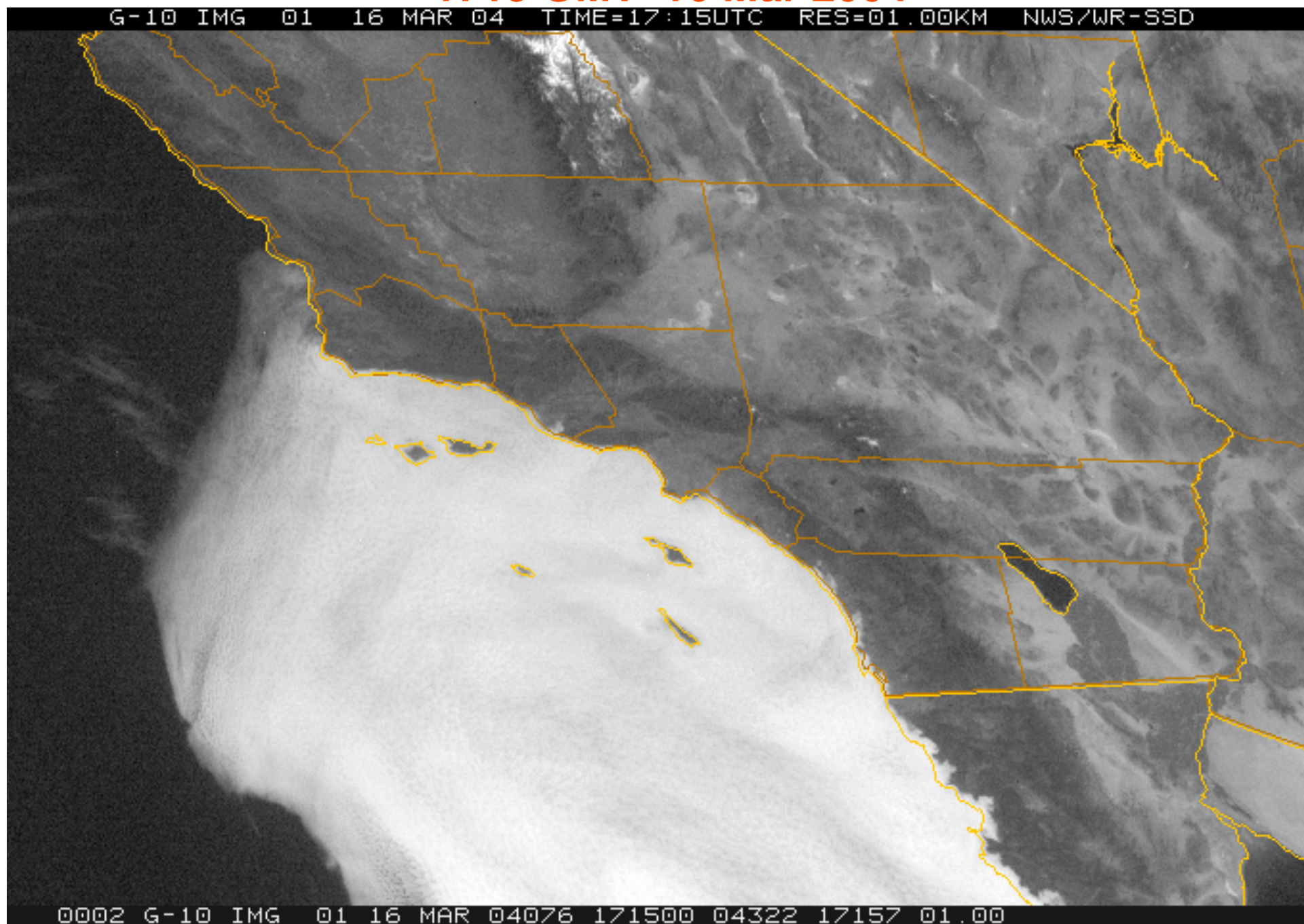
1630 GMT 06 Jun 2002

G-10 IMG 01 6 JUN 02 TIME=16:30UTC RES=01.00KM NWS/WR-SSD

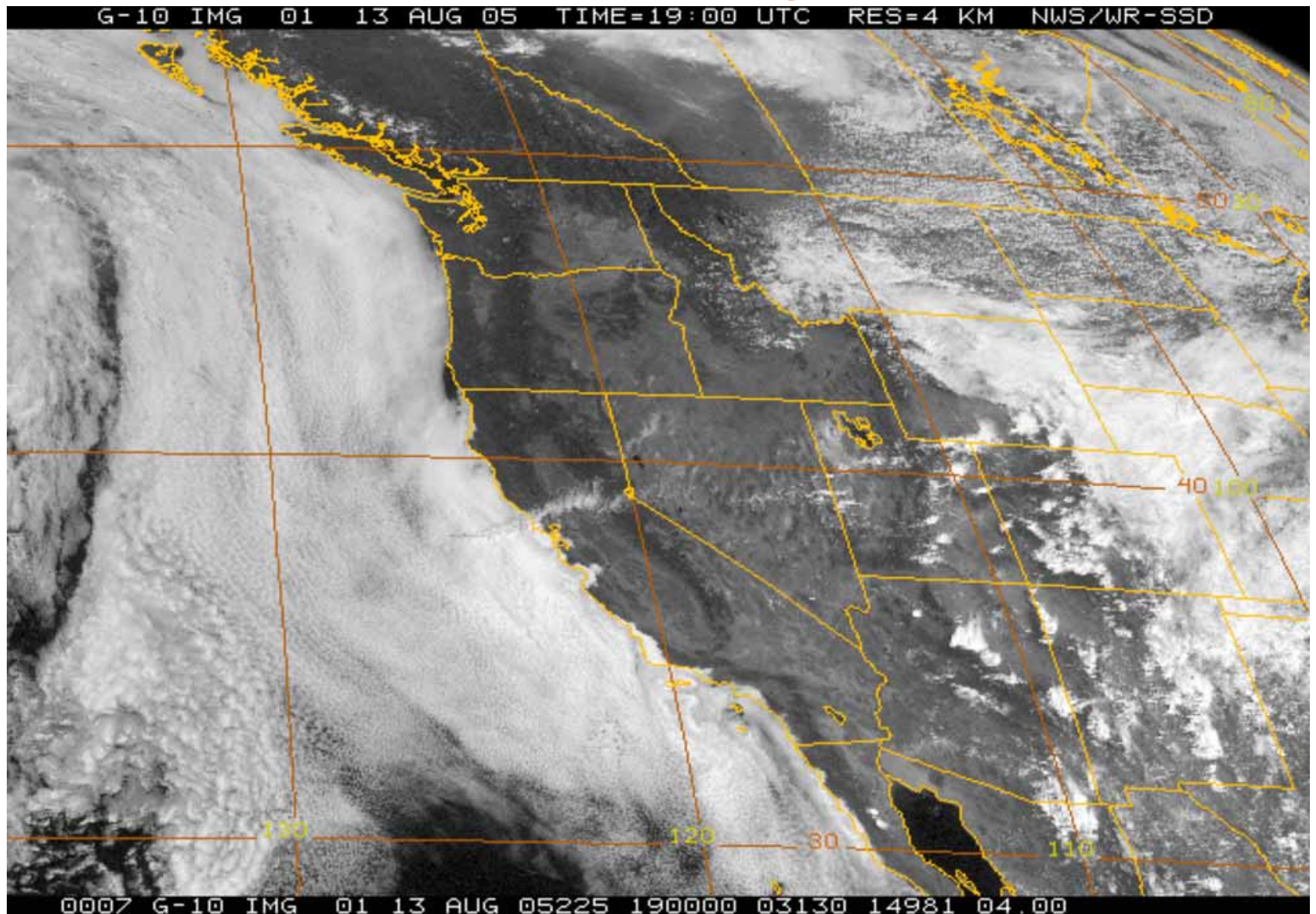


0002 G-10 IMG 01 6 JUN 02157 163000 04425 17382 01.00

1715 GMT 16 Mar 2004

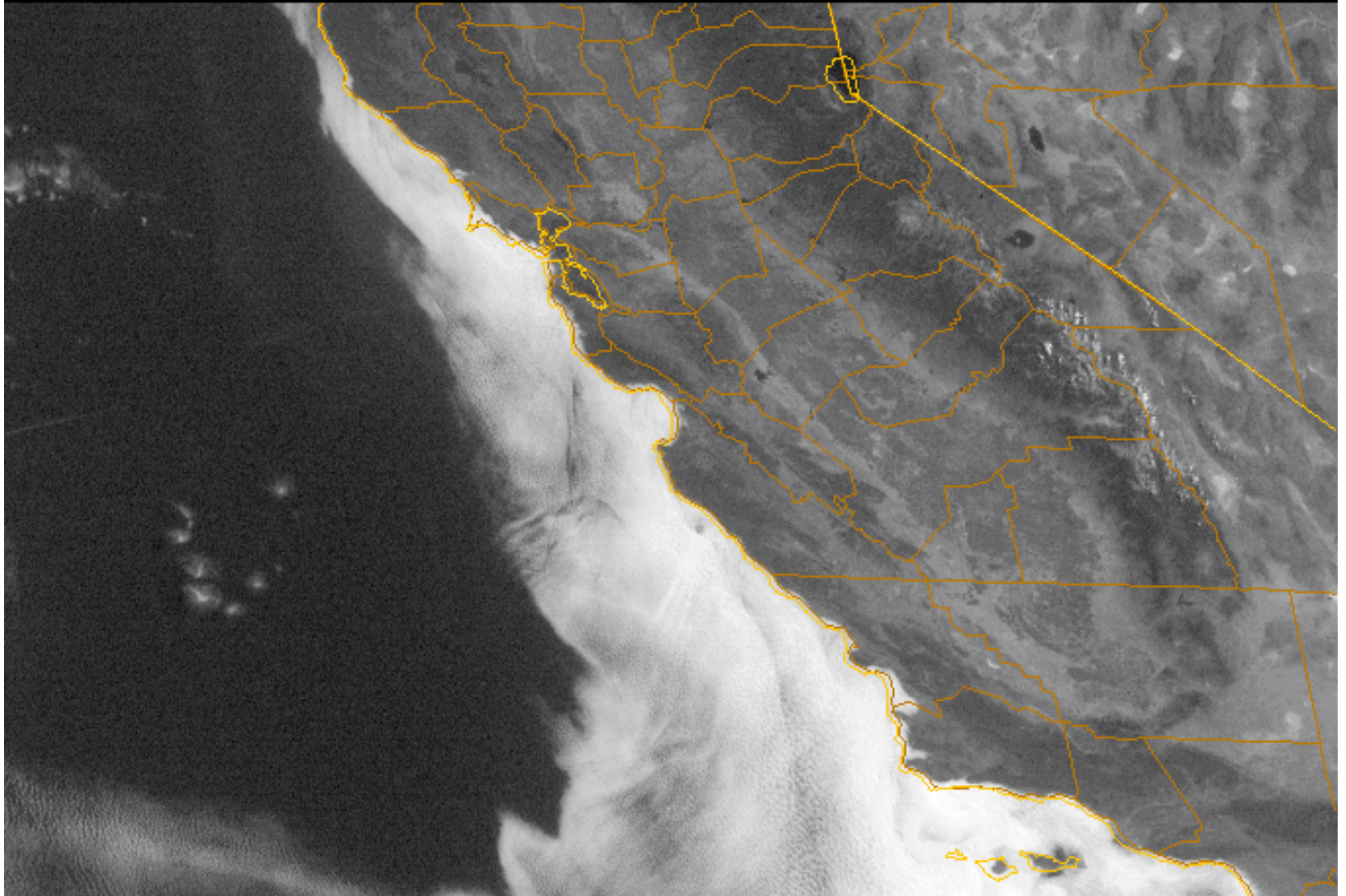


1900 GMT 13 Aug 2005



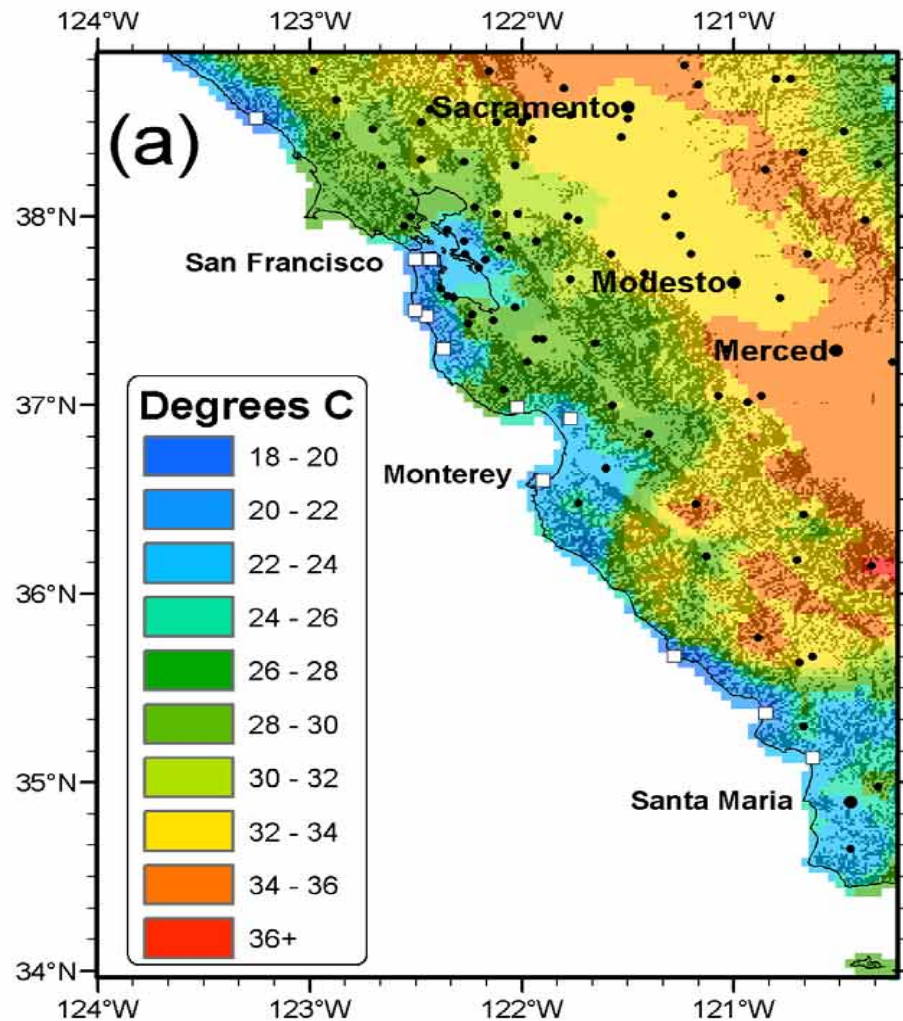
1700 GMT 11 Aug 2005

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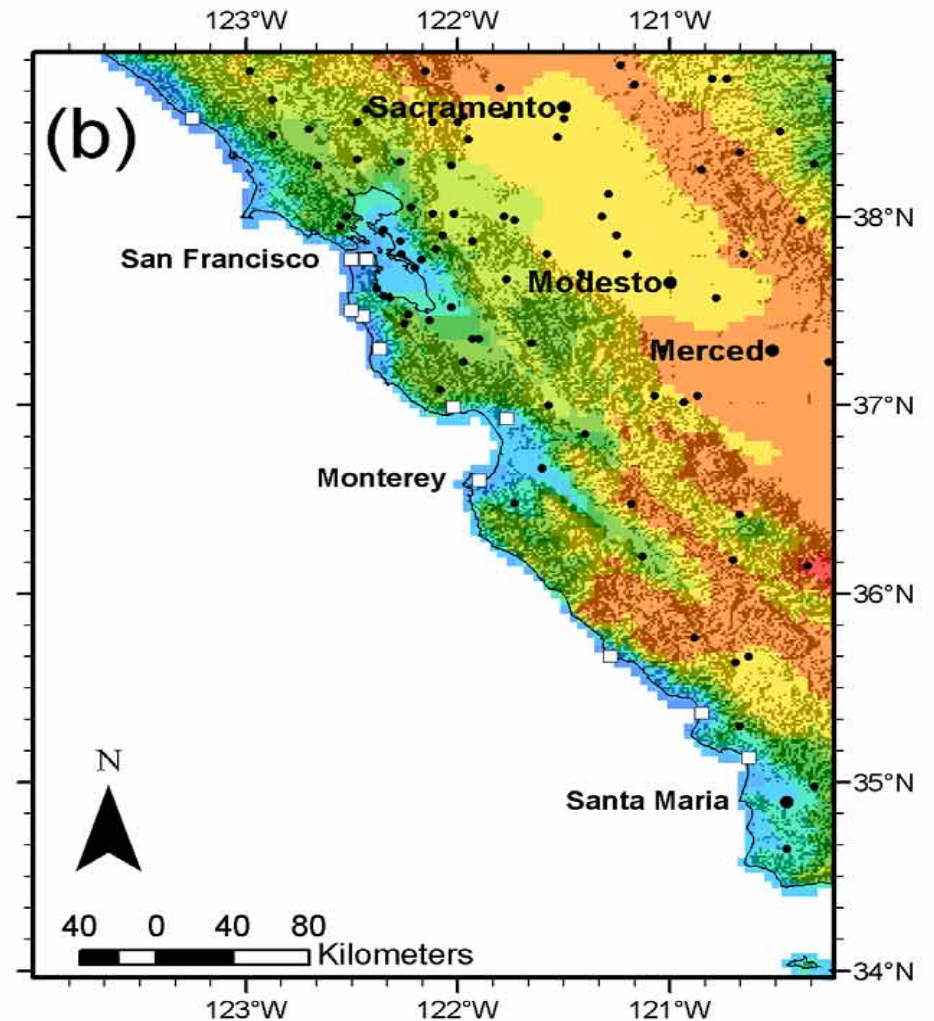


0002 G-10 IMG 01 11 AUG 05223 170000 04101 16571 01.00

1961-1990 Mean July Maximum Temperature from PRISM



With Coastal Proximity weighting OFF



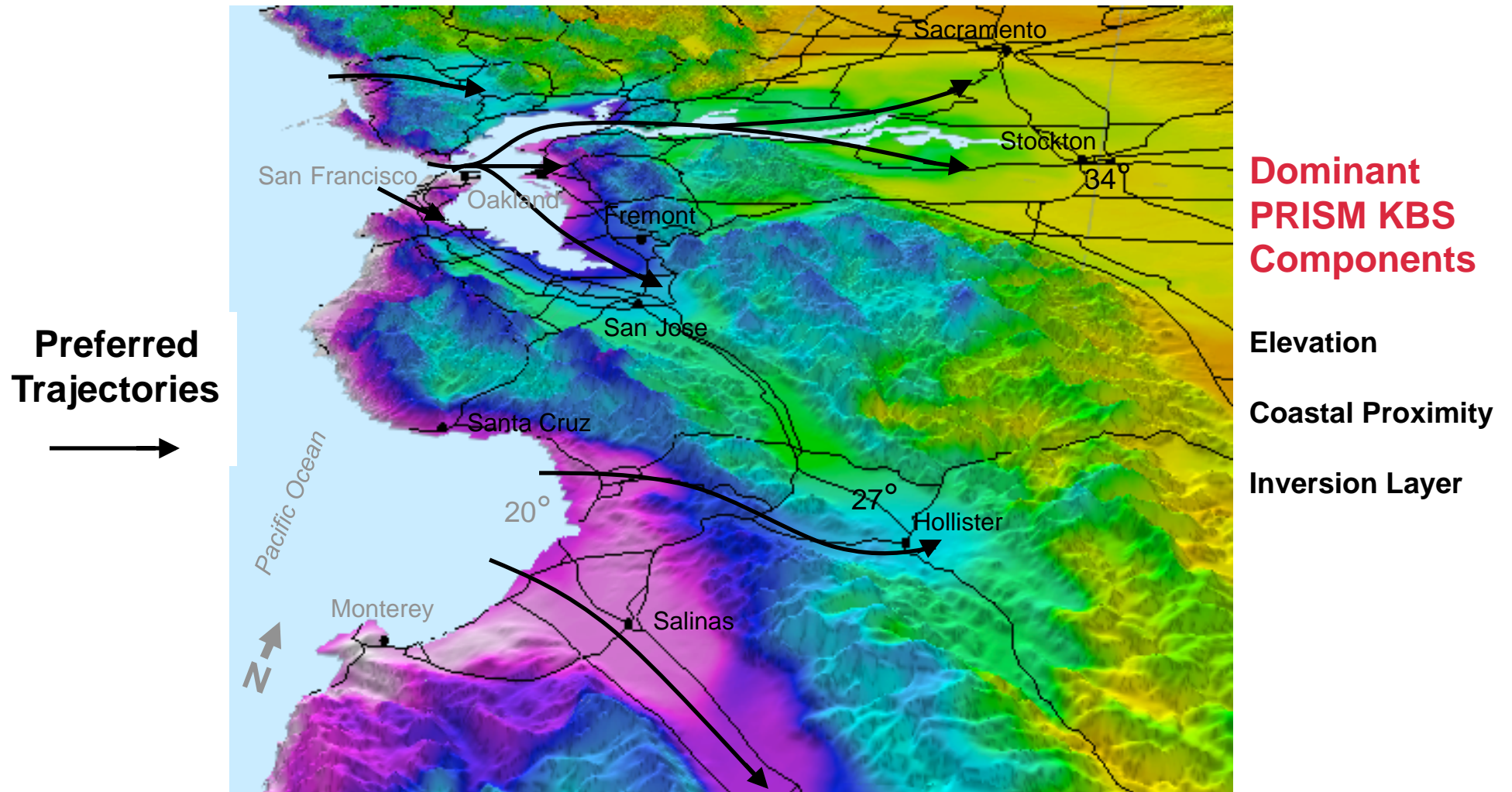
With Coastal Proximity weighting ON





Big Sur

Coastal Effects: 1971-00 July Maximum Temperature Central California Coast – 1 km



Courtesy Chris Daly

Mapping New Terrain

Climate Change and America's West



Anticipating Challenges to Western Mountain Ecosystems and Resources

The Consortium for Integrated Climate Research in
Western Mountains
(CIRMOLINT)

July 2006



South

Central Sierra Snow Lab



East

Photo: Dave Simeral

**Slide Mountain
Toward SSW**



Mt Warren Summit Station 12,327 ft



**White Mtn Summit, 14246 ft
Reconfigured July 2004**





California Climate Tracker

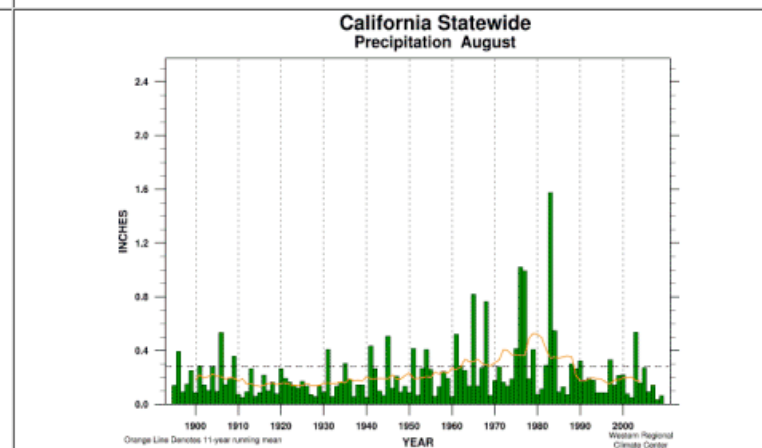
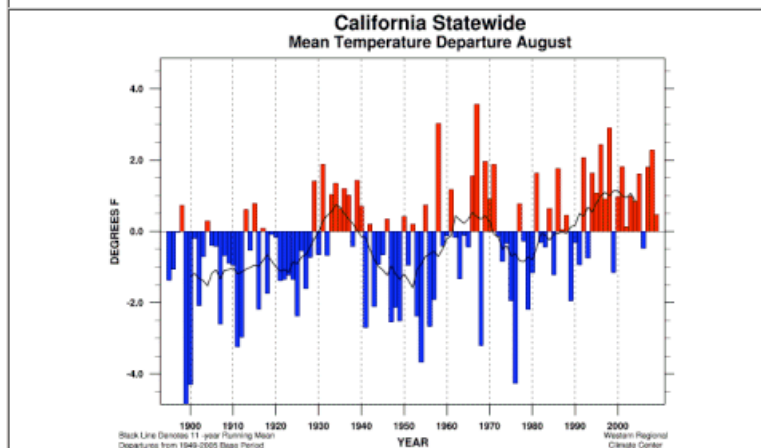
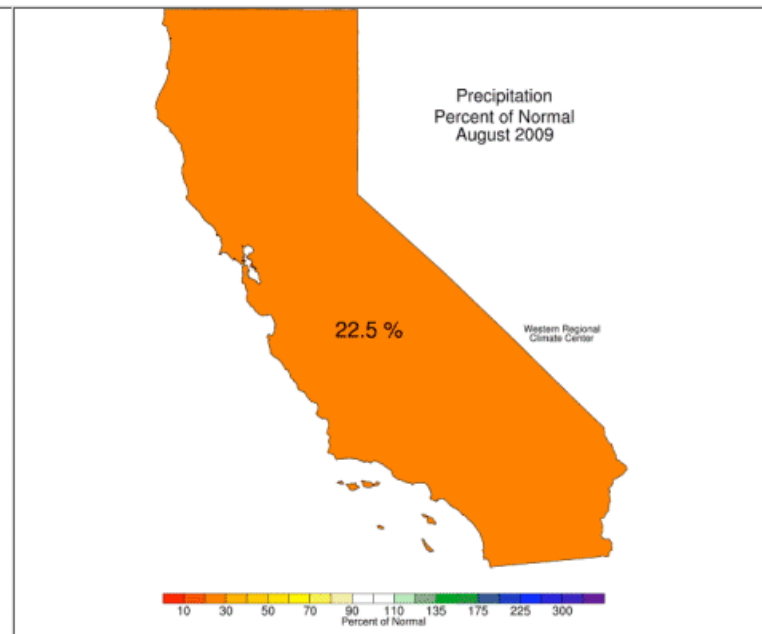
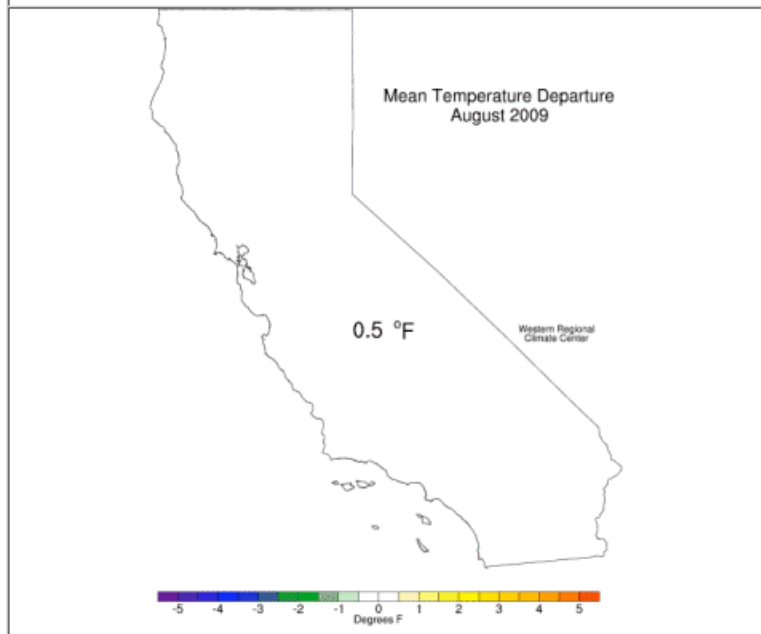
Tracking Climate Variability and Change for the State



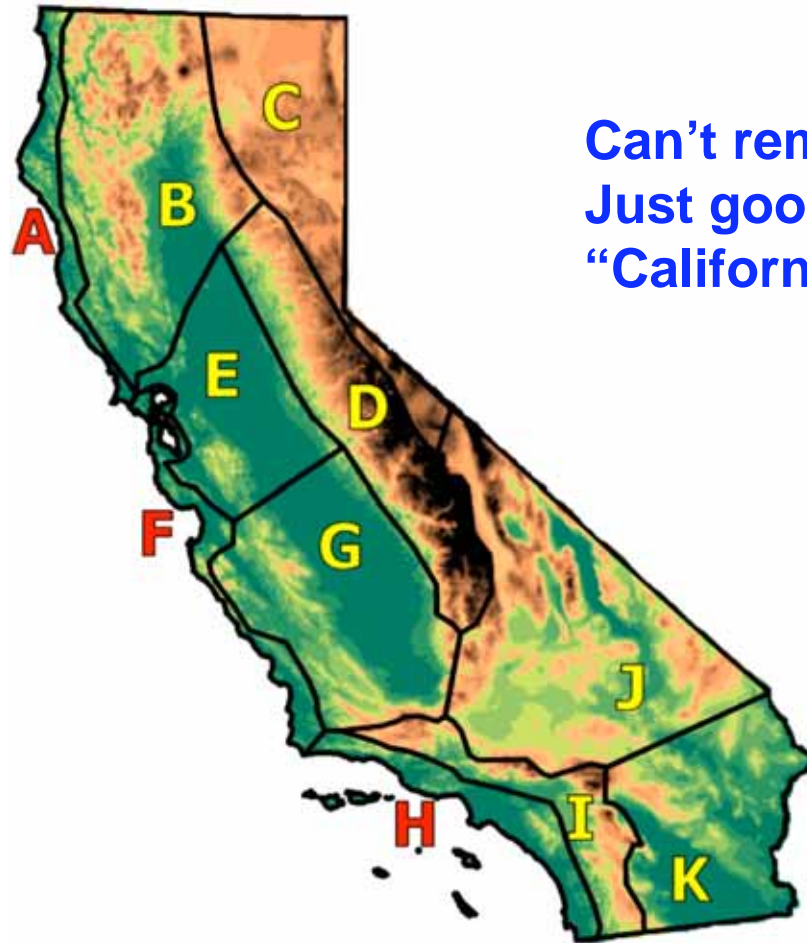
[Explore Climate Products](#)

Updated by John Abatzoglou

AUGUST 2009



Eleven climate monitoring regions determined from this analysis

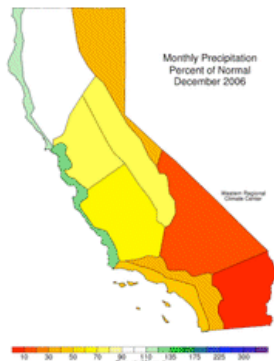


Can't remember ???
Just google
"California Climate Tracker".

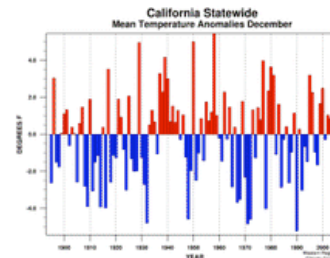
Abatzoglou, J.T, K.T. Redmond, and L.M. Edwards, 2009. Classification of regional climate variability in the state of California. J. Appl. Meteor. Climatol., 48(8), 1527-1541.

Select from the Menu to the Right

Latest Graphics



Time Series



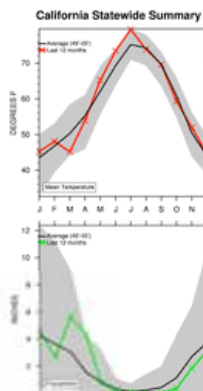
Latest Graphics

Select Region
 Select Element
 Select Data Type
 Select Time Period
 Select

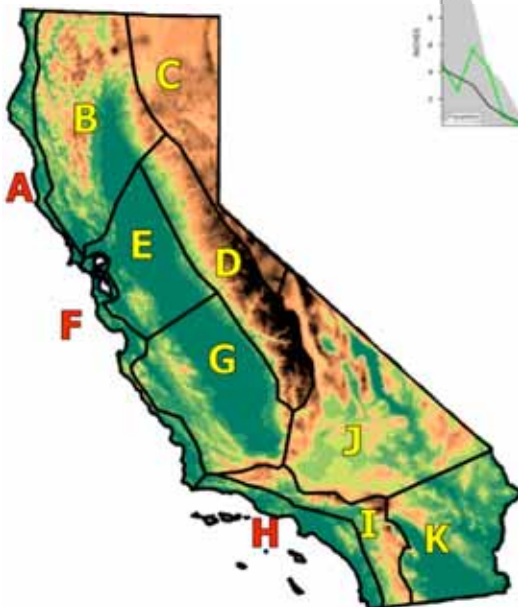
Time Series

Select Region
 Select Element
 Select Time Period
 Select

Last 12 Months



- Climate region data: 1895 to present
- Averages taken from: 1949-2005



Time Series

Sierra
 Select Region
 Statewide
 Sierra
 Northeast
 North Central
 Sacramento-Delta
 San Joaquin Valley
 North Coast
 Central Coast
 South Coast
 South Interior
 Mohave
 Sonoran

Time Series

Select Region
 Select Element
 Select Element
 Maximum Temperature
 Minimum Temperature
 Mean Temperature
 Precipitation
 Temperature Summary

Time Series

Select Region
 Select Element
 Select Time Period
 March
 April
 May
 June
 July
 August
 September
 October
 November
 December
 Winter (DJF)
 Spring (MAM)
 Summer (JJA)
 Autumn (SON)
 Calendar Year (Jan-Dec)
 Water Year (Oct-Sep)
 Water Year (Jul-Jun)
 January to Present
 October To Present
 July To Present

Summary of the Past 12 Months

Select Region GO

[Climate Regions](#)
[Plot Data](#)

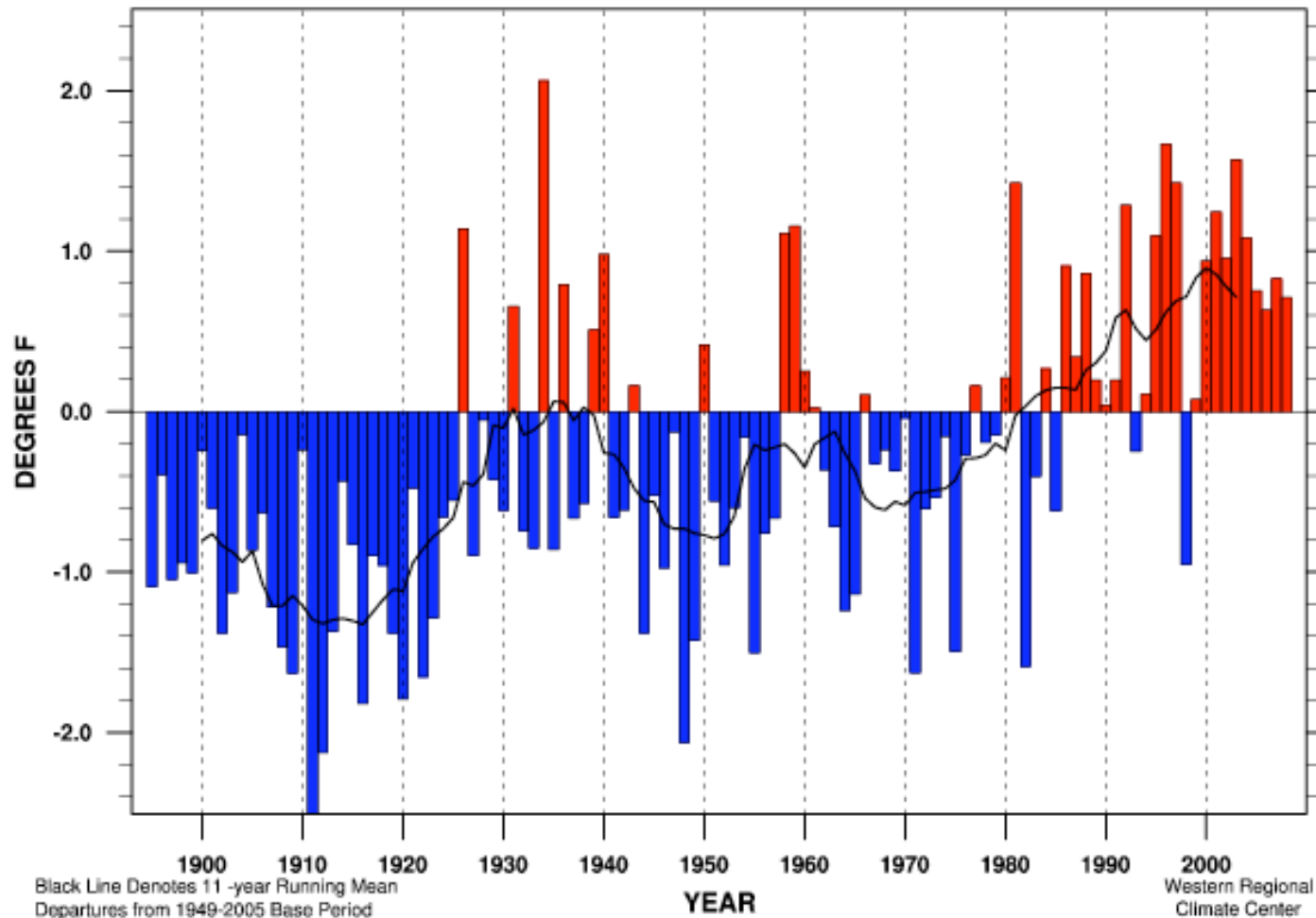
[More Info](#)
[Retrieves Data](#)

[Back to the California Climate Tracker](#)
[Non-Frames Version](#)



Several types of summaries
 And presentations available.

California Statewide Mean Temperature Departure Jan-Dec

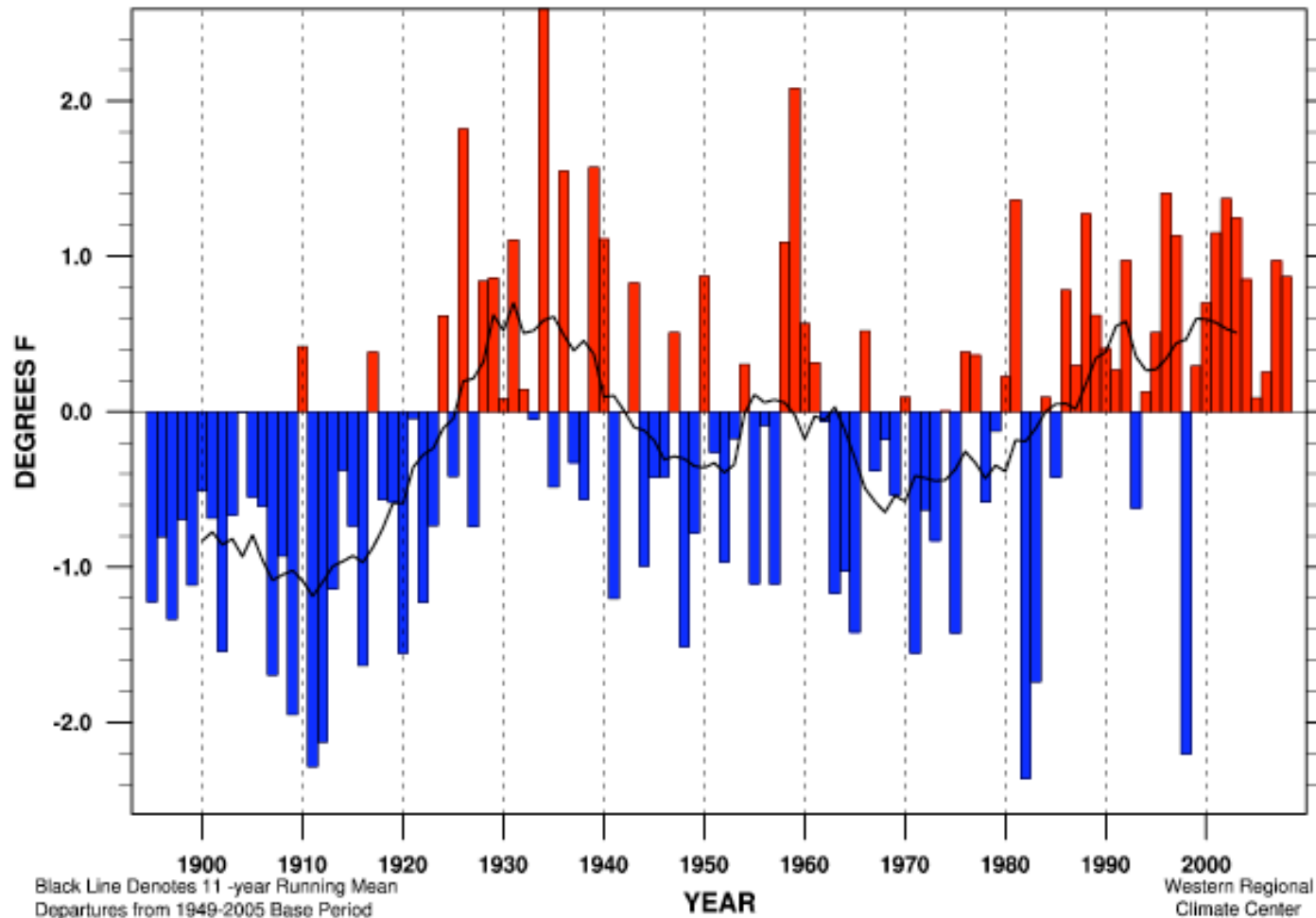


State
Annual
Mean Temp

1895-2008

Linear Trend 1895-present	$+ 1.55 \pm 0.43^{\circ}\text{F}/100\text{yr}$	
Linear Trend 1949-present	$+ 2.76 \pm 1.07^{\circ}\text{F}/100\text{yr}$	
Linear Trend 1975-present	$+ 4.37 \pm 2.49^{\circ}\text{F}/100\text{yr}$	
Warmest Year	58.1°F (+ 2.1°F) in 1934	MEAN 56.1°F
Coldest Year	53.6°F (- 2.5°F) in 1911	STDEV 0.87 °F
Jan-Dec	2008 56.8°F (+ 0.7°F)	RANK 94 of 114

California Statewide Maximum Temperature Departure Jan-Dec

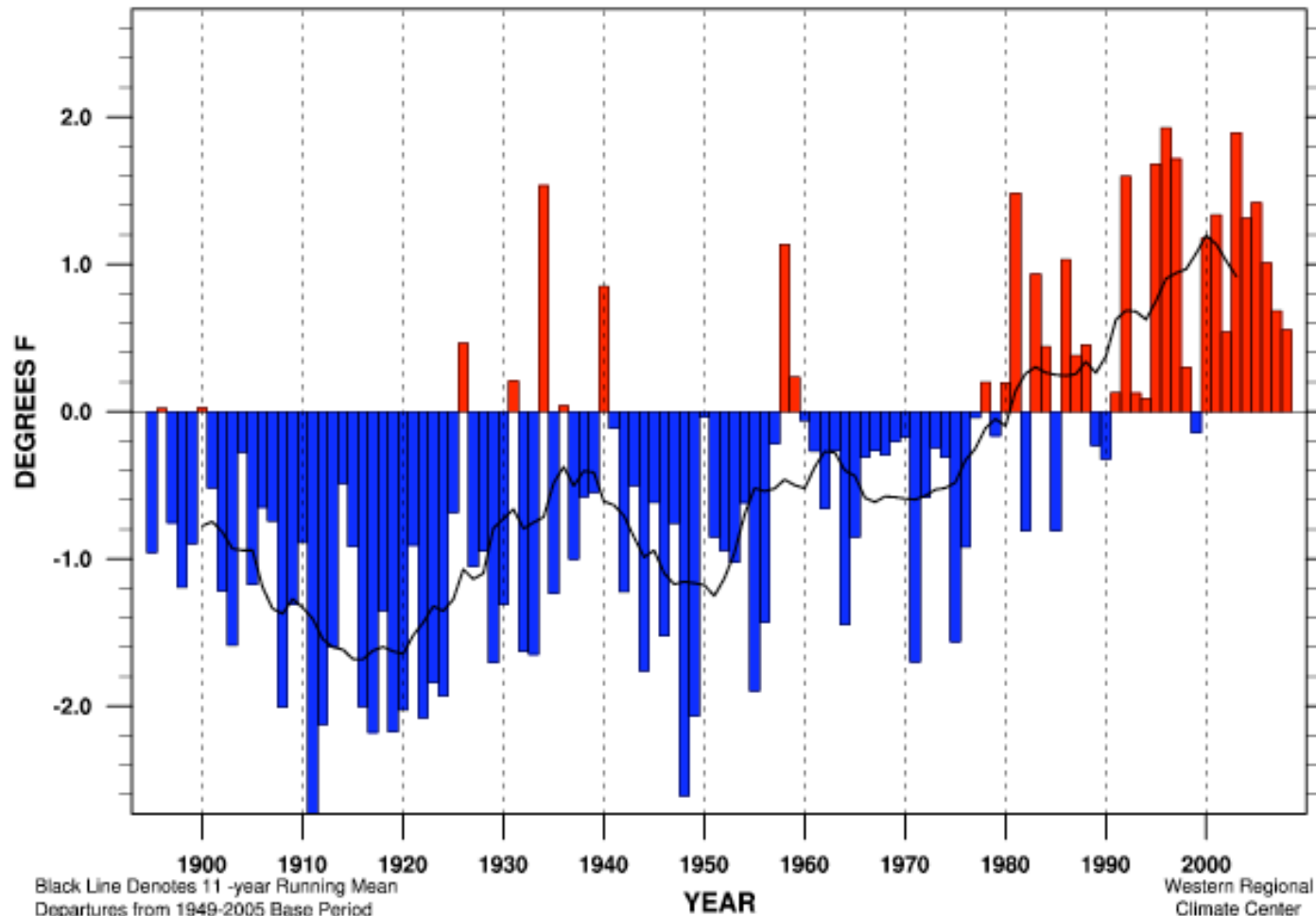


State
Annual
Mean Max Temp

1895 - 2008

Linear Trend 1895-present	$+ 1.09 \pm 0.53^{\circ}\text{F}/100\text{yr}$	
Linear Trend 1949-present	$+ 1.74 \pm 1.35^{\circ}\text{F}/100\text{yr}$	
Linear Trend 1975-present	$+ 3.80 \pm 3.26^{\circ}\text{F}/100\text{yr}$	
Warmest Year	71.6 °F (+ 2.6 °F) in 1934	MEAN 69.0 °F
Coldest Year	66.6 °F (- 2.4 °F) in 1982	STDEV 0.95 °F
Jan-Dec	2008	69.9 °F (+ 0.9 °F) RANK 96 of 114

California Statewide Minimum Temperature Departure Jan-Dec

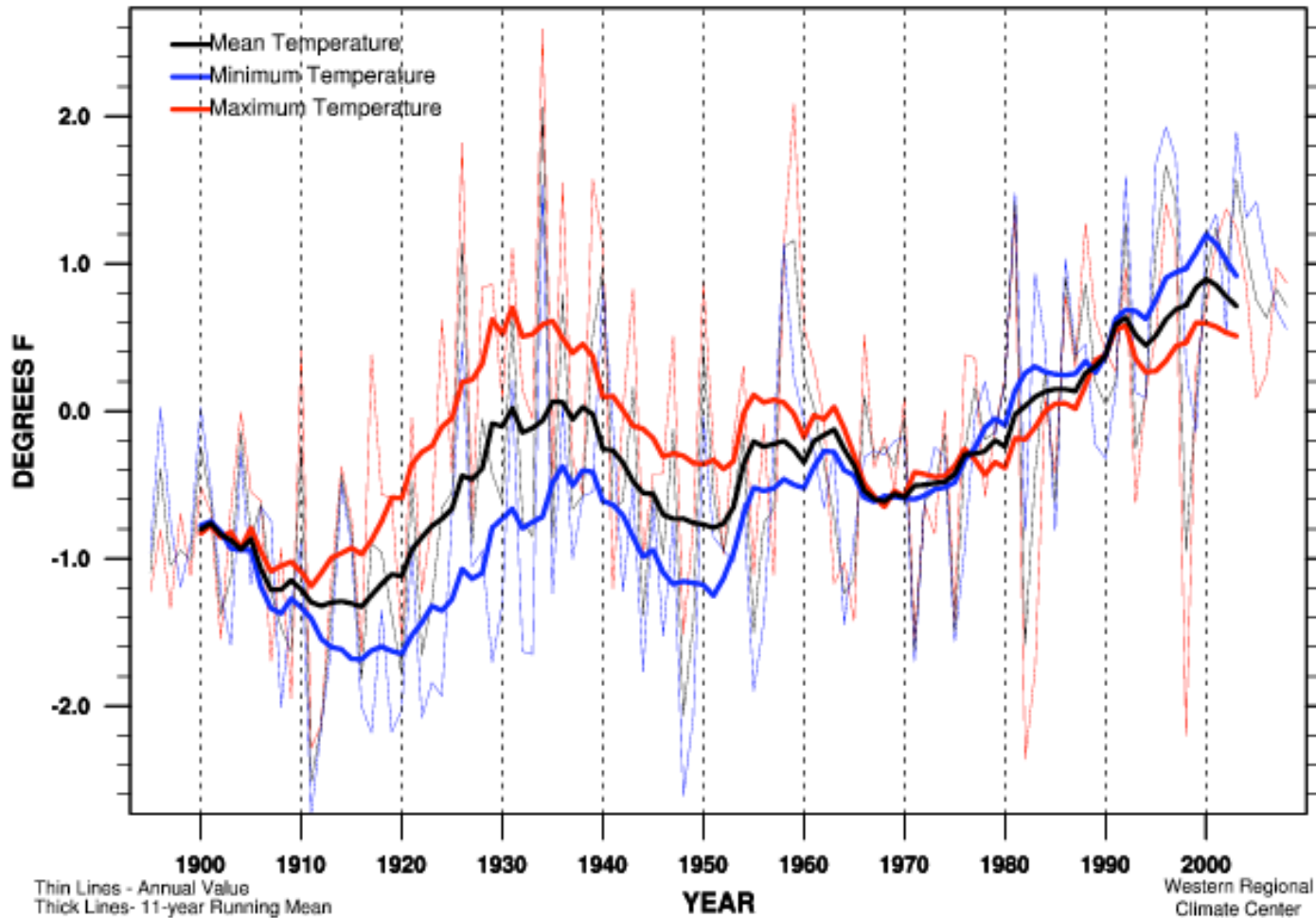


State
Annual
Mean Min Temp

1895 – 2008

Linear Trend 1895-present	+ 2.02 ± 0.47°F/100yr	
Linear Trend 1949-present	+ 3.79 ± 1.06°F/100yr	
Linear Trend 1975-present	+ 4.95 ± 2.60°F/100yr	
Warmest Year	45.1°F (+ 1.9°F) in 1996	MEAN 43.1°F
Coldest Year	40.4°F (- 2.7°F) in 1911	STDEV 0.98 °F
Jan-Dec	2008	43.7°F (+ 0.6°F) RANK 97 of 114

California Statewide Temperature Departure Jan-Dec



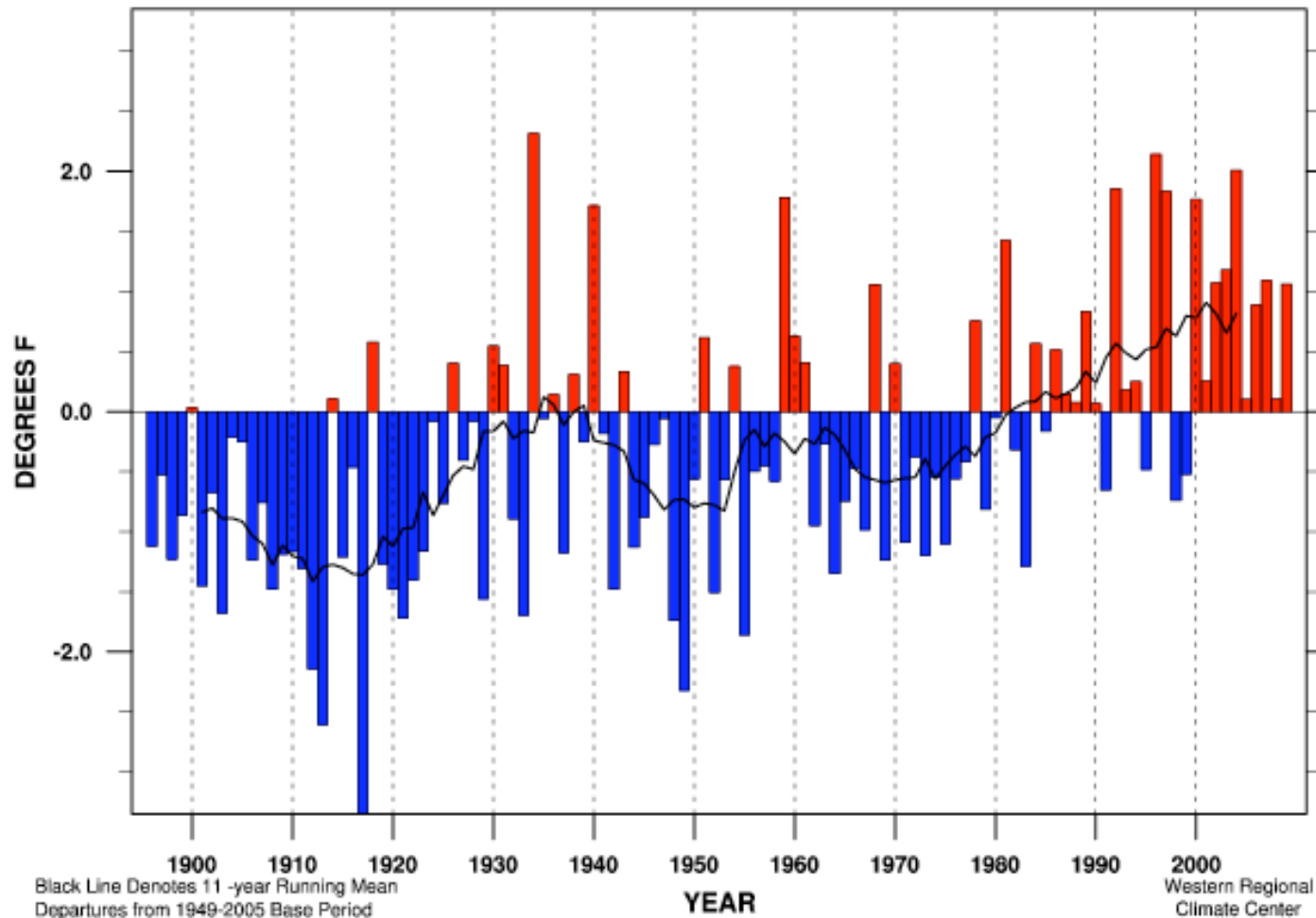
**State
Annual
Temperature
Summary**

(Max, Mean, Min)

1895-2008

	Maximum Temperature	Minimum Temperature
Linear Trend 1895-present	+ 1.09 (± 0.53) °F/100yr	+ 2.02 (± 0.47) °F/100yr
Linear Trend 1949-present	+ 1.74 (± 1.35) °F/100yr	+ 3.79 (± 1.06) °F/100yr
Linear Trend 1975-present	+ 3.80 (± 3.26) °F/100yr	+ 4.95 (± 2.60) °F/100yr

California Statewide Mean Temperature Departure Jul-Jun

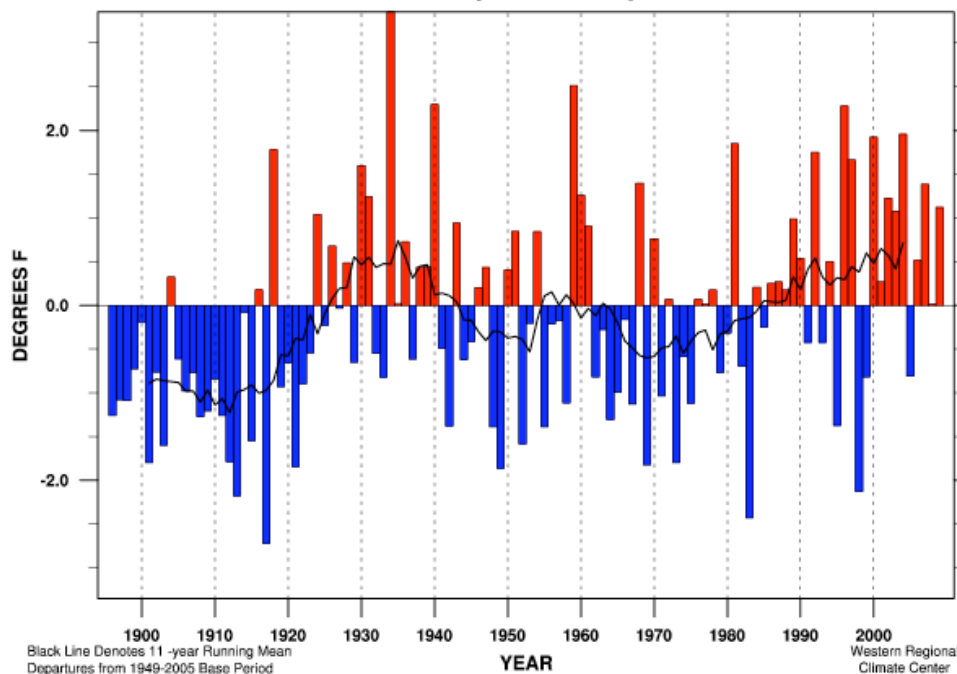


Statewide
12-Month
Winter-Centered
Year (July-June)

1895-96
thru
2008-2009

Linear Trend 1895-present	$+ 1.57 \pm 0.52^{\circ}\text{F}/100\text{yr}$	
Linear Trend 1949-present	$+ 2.61 \pm 1.28^{\circ}\text{F}/100\text{yr}$	
Linear Trend 1975-present	$+ 3.70 \pm 2.96^{\circ}\text{F}/100\text{yr}$	
Warmest Year	58.4 °F (+ 2.3 °F) in 1934	MEAN 56.1°F
Coldest Year	52.7 °F (- 3.4 °F) in 1917	STDEV 0.98 °F
Jul-Jun	2009 57.1°F (+ 1.1°F)	RANK 102 of 114

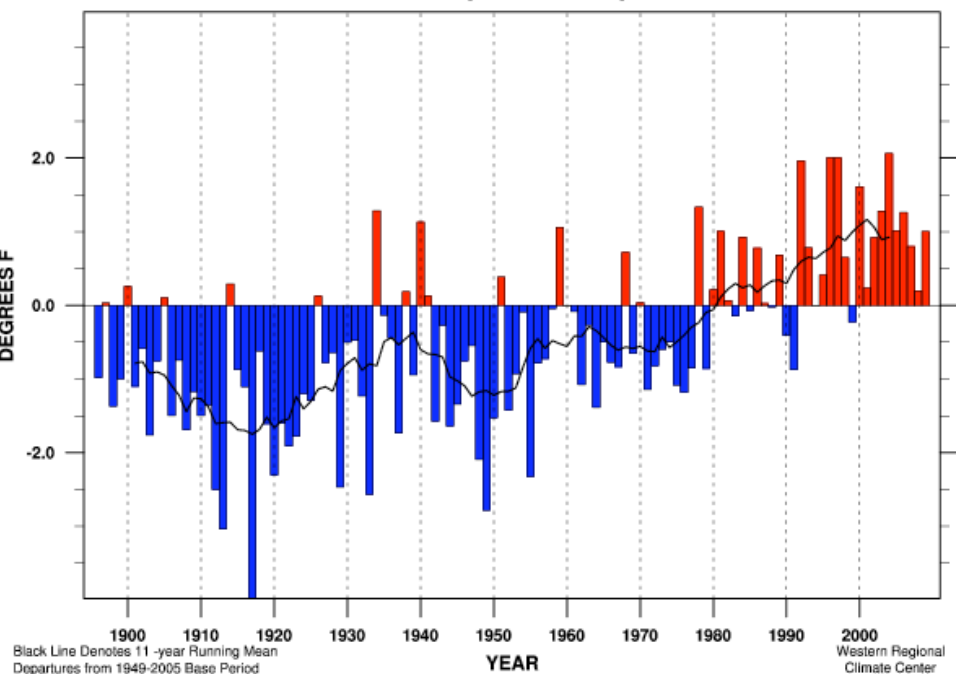
**California Statewide
Maximum Temperature Departure Jul-Jun**



Linear Trend 1895-present	+ 1.10 ± 0.62 °F/100yr
Linear Trend 1949-present	+ 1.61 ± 1.67 °F/100yr
Linear Trend 1975-present	+ 3.17 ± 3.92 °F/100yr
Warmest Year	72.4 °F (+ 3.4 °F) in 1934
Coldest Year	66.3 °F (- 2.7 °F) in 1917
Jul-Jun	2009 70.1 °F (+ 1.1 °F)

MEAN	69.0 °F
STDEV	1.16 °F
RANK	98 of 114

**California Statewide
Miniumum Temperature Departure Jul-Jun**



Linear Trend 1895-present	+ 2.05 ± 0.52 °F/100yr
Linear Trend 1949-present	+ 3.61 ± 1.14 °F/100yr
Linear Trend 1975-present	+ 4.22 ± 2.76 °F/100yr
Warmest Year	45.2 °F (+ 2.1 °F) in 2004
Coldest Year	39.2 °F (- 4.0 °F) in 1917
Jul-Jun	2009 44.1 °F (+ 1.0 °F)

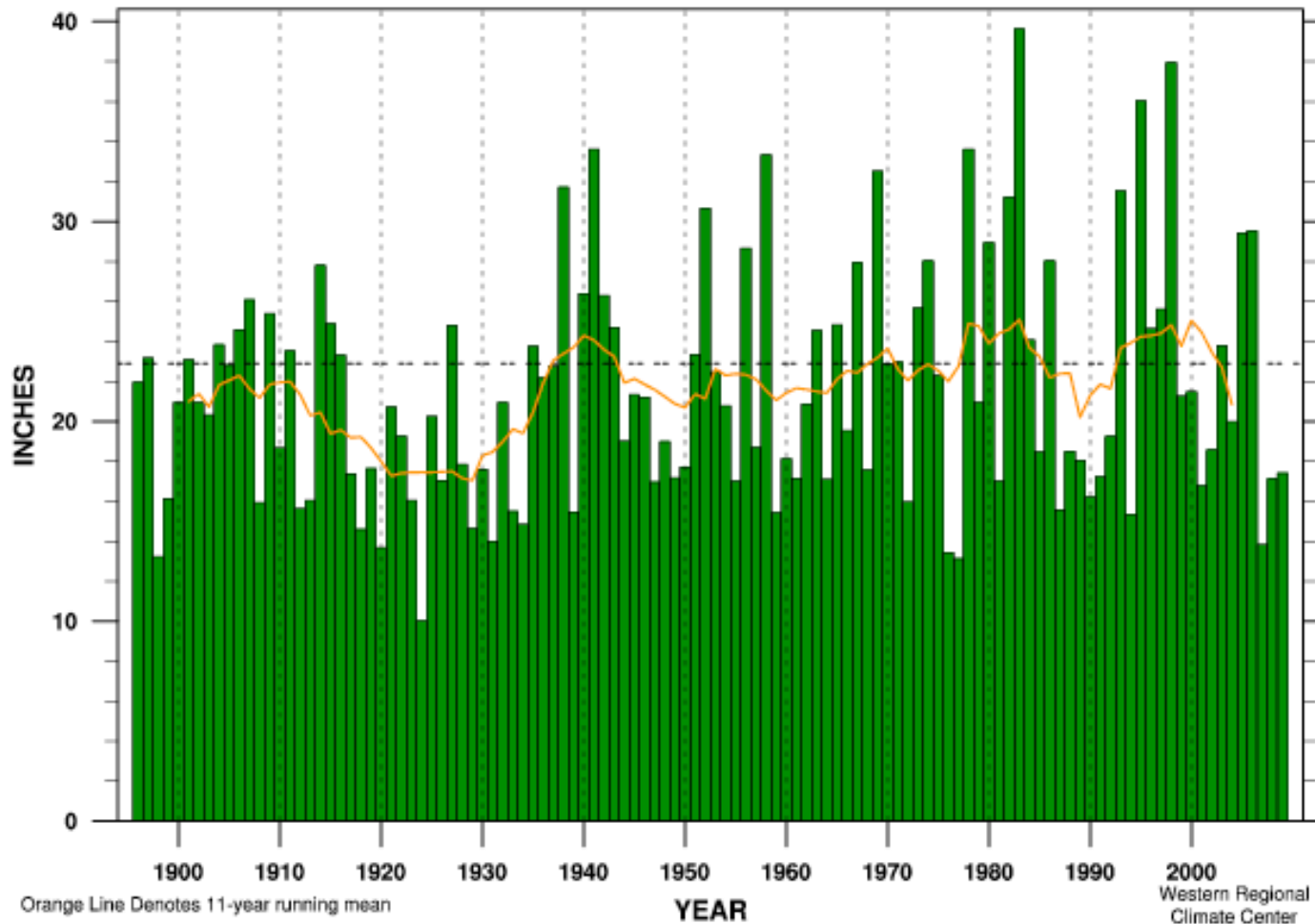
MEAN	43.1 °F
STDEV	1.00 °F
RANK	101 of 114

Statewide Winter-Centered July-June

Mean Max Temperature

Mean Min Temperature

California Statewide Precipitation Jul-Jun



**Is California
in
drought ???**

**Frequent
question
from the US
Drought
Monitor**

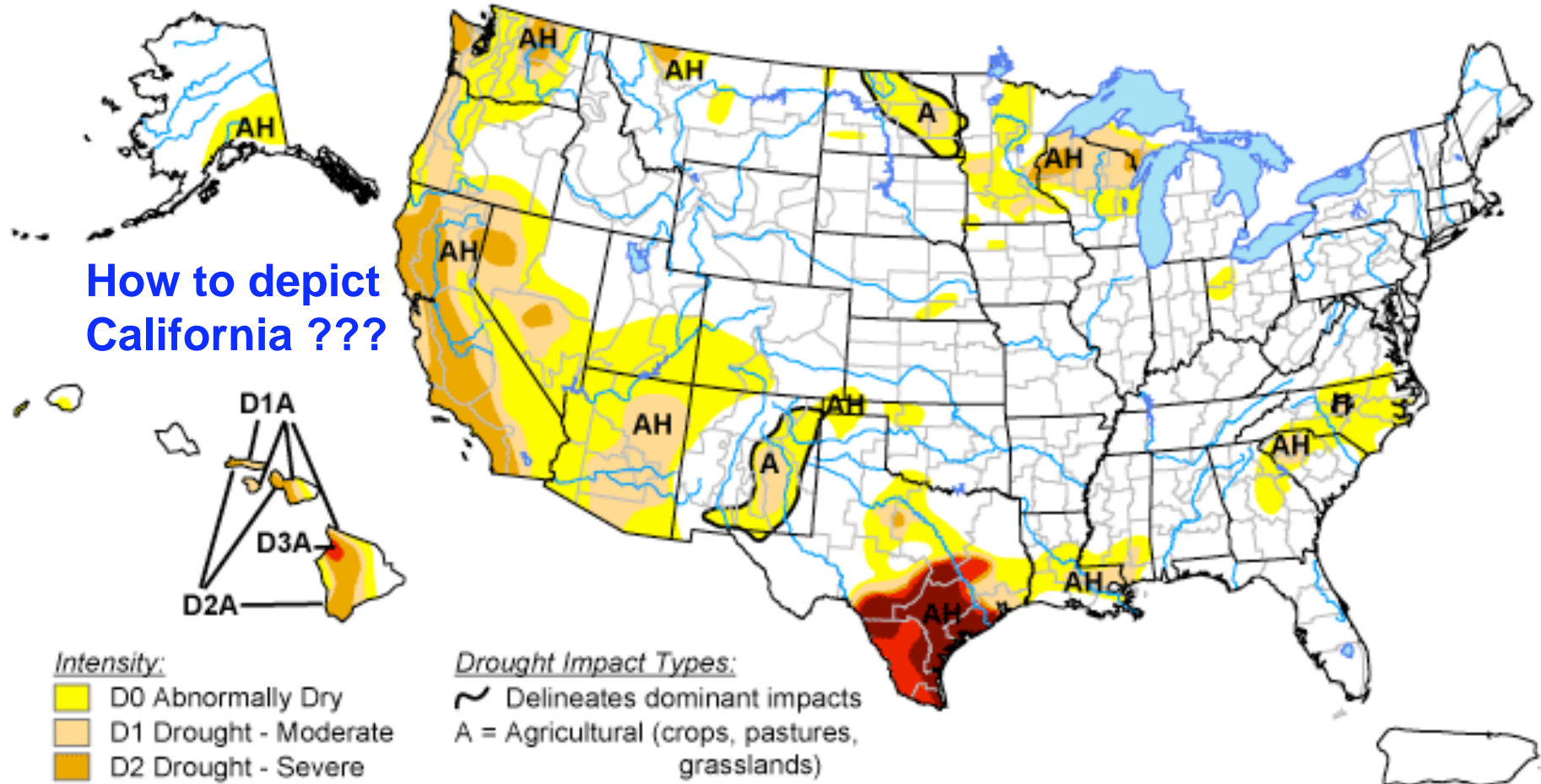
**Statewide
Winter-
Centered
July-June
Precipitation**

Linear Trend 1895-present	+ 3.25 ± 3.24 in.	(+ 14 ± 14%) per 100 yr	
Linear Trend 1949-present	+ 0.27 ± 9.75 in.	(+ 1 ± 42%) per 100 yr	
Linear Trend 1975-present	- 4.08 ± 26.61 in.	(- 17 ± 116%) per 100 yr	
Wettest Year	39.63 in. (173%) in 1983	MEAN	22.89 in.
Driest Year	10.03 in. (43%) in 1924	STDEV	6.46 in.
Jul-Jun	2009	17.42 in. (76%)	RANK 34 of 114

U.S. Drought Monitor

September 1, 2009

Valid 8 a.m. EDT



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

- ~ Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

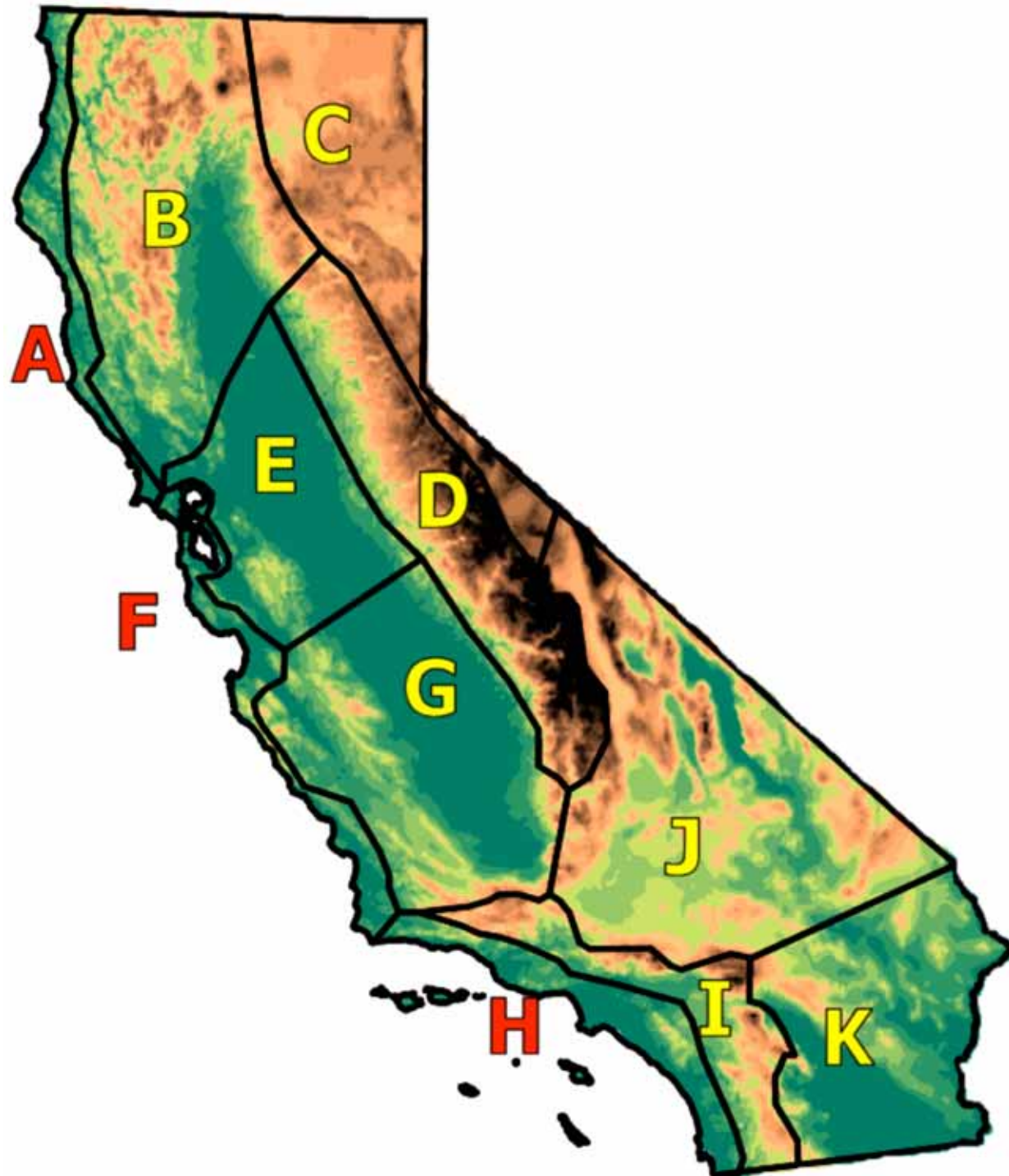
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://drought.unl.edu/dm>

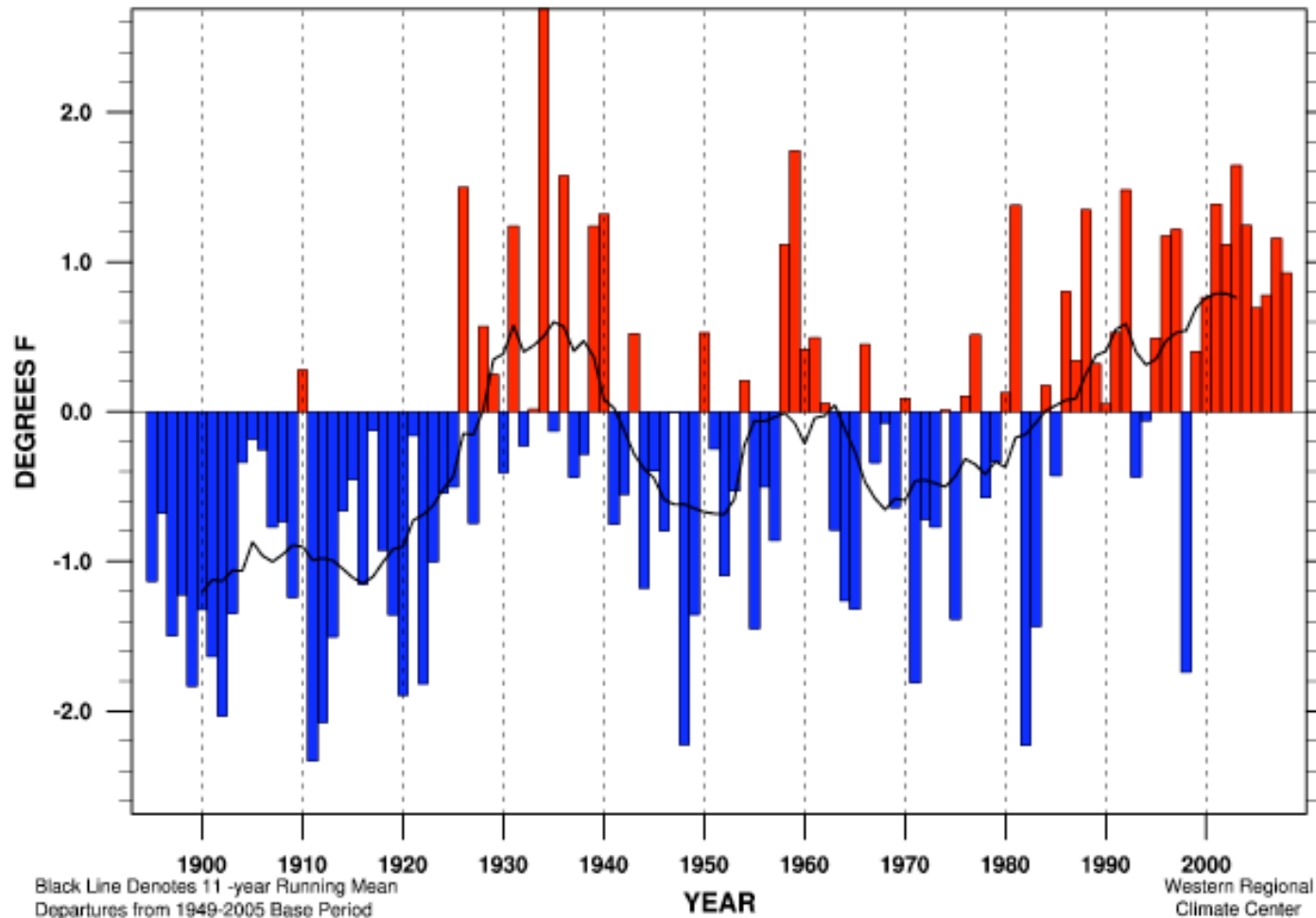


Released Thursday, September 3, 2009

Author: Brad Rippey, U.S. Department of Agriculture



Sierra Region Mean Temperature Departure Jan-Dec

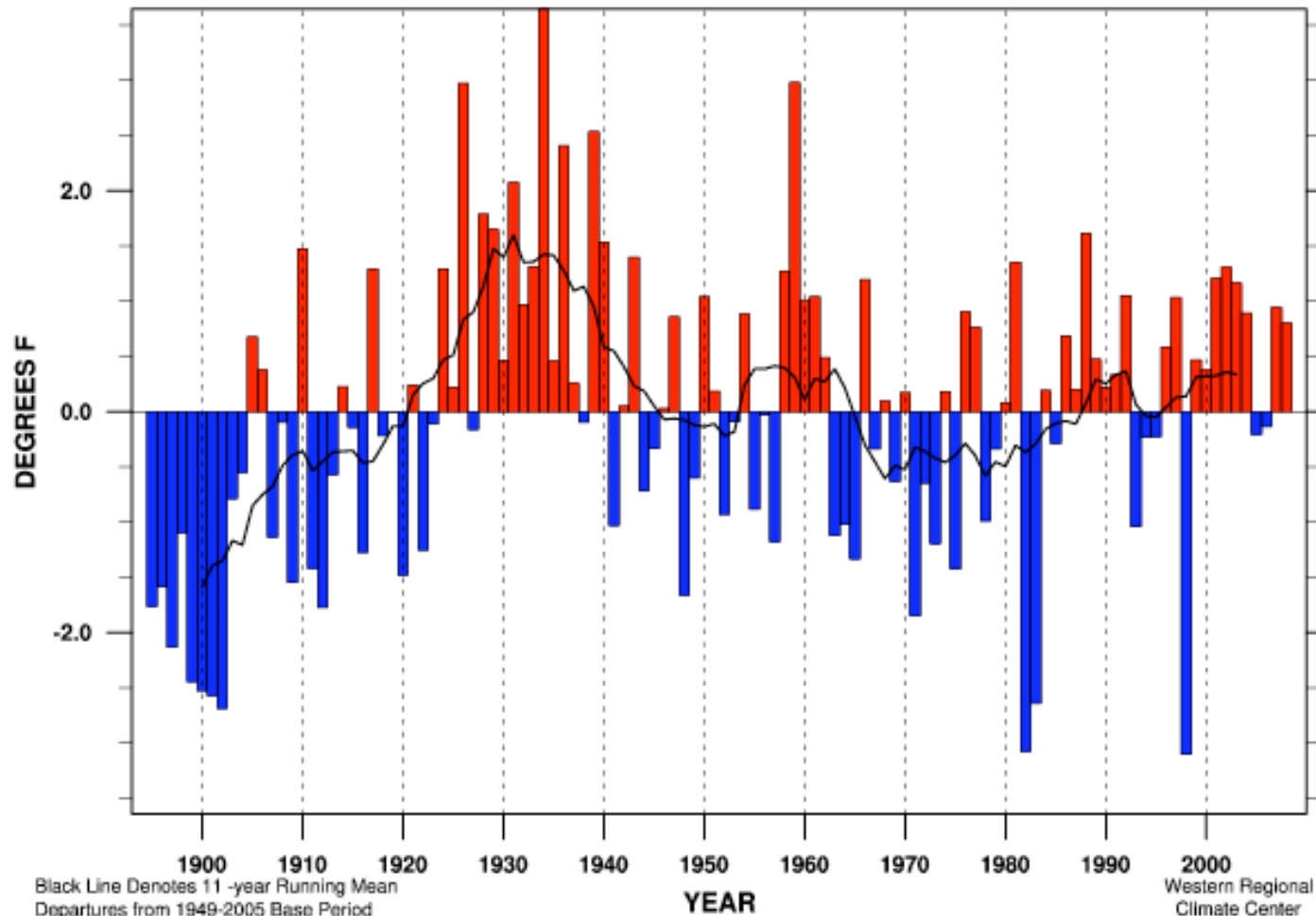


Sierra Nevada
Annual
Mean
Temperature

1895 - 2008

Linear Trend 1895-present	$+ 1.44 \pm 0.52^{\circ}\text{F}/100\text{yr}$	
Linear Trend 1949-present	$+ 2.45 \pm 1.30^{\circ}\text{F}/100\text{yr}$	
Linear Trend 1975-present	$+ 4.82 \pm 3.02^{\circ}\text{F}/100\text{yr}$	
Warmest Year	51.7 °F (+ 2.7 °F) in 1934	MEAN 49.0 °F
Coldest Year	46.7 °F (- 2.3 °F) in 1911	STDEV 0.97 °F
Jan-Dec	2008 49.9 °F (+ 0.9 °F)	RANK 96 of 114

Sierra Region Maximum Temperature Departure Jan-Dec



Sierra Nevada
Annual
Maximum
Temperature

1895 - 2008

Linear Trend 1895-present $+ 0.73 \pm 0.73^{\circ}\text{F}/100\text{yr}$

Linear Trend 1949-present $+ 0.65 \pm 1.70^{\circ}\text{F}/100\text{yr}$

Linear Trend 1975-present $+ 3.24 \pm 4.13^{\circ}\text{F}/100\text{yr}$

Warmest Year 65.1°F ($+ 3.6^{\circ}\text{F}$) in 1934

MEAN 61.5°F

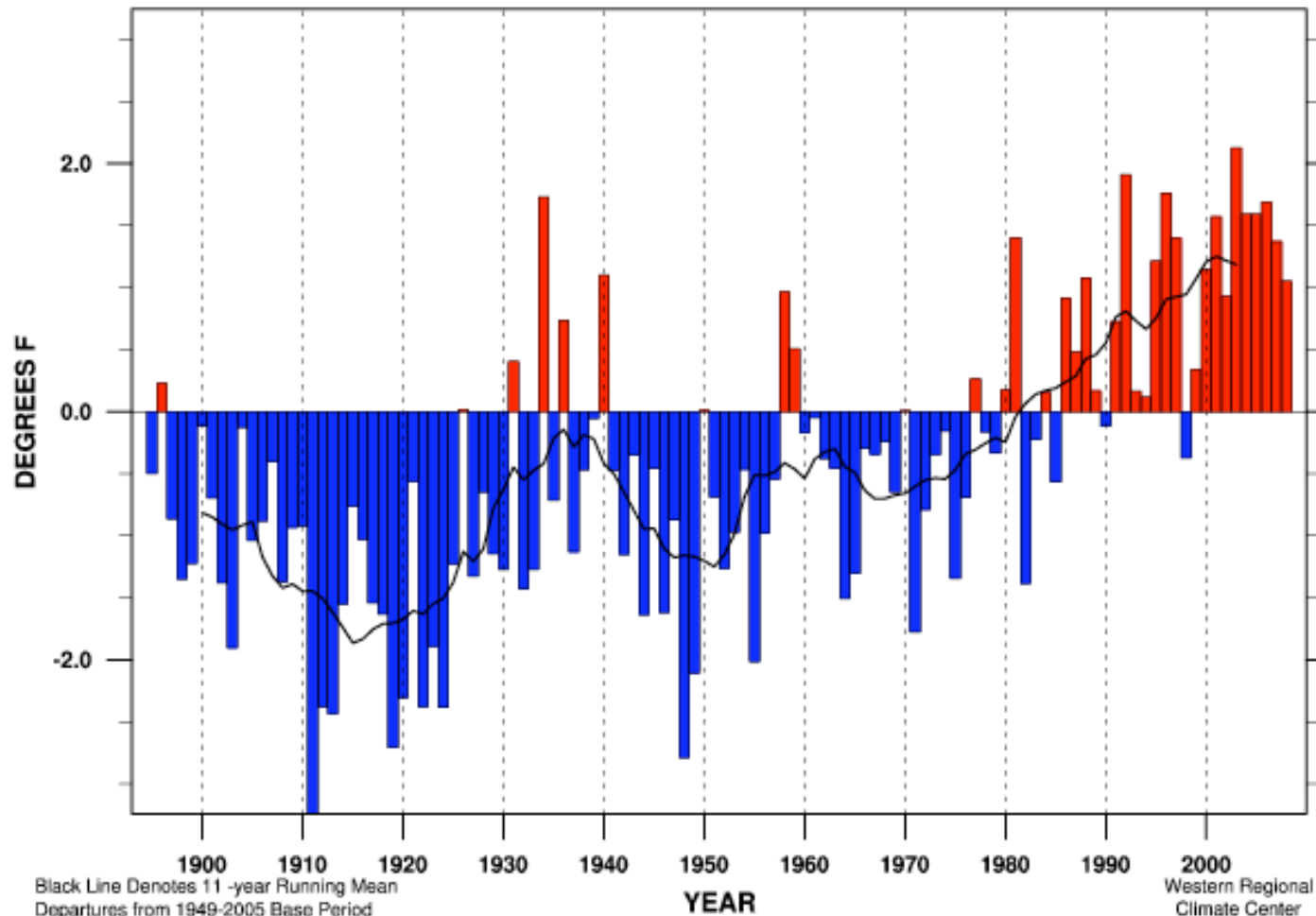
Coldest Year 58.4°F ($- 3.1^{\circ}\text{F}$) in 1998

STDEV 1.15°F

Jan-Dec 2008 62.3°F ($+ 0.8^{\circ}\text{F}$)

RANK 82 of 114

Sierra Region Minimum Temperature Departure Jan-Dec



Sierra Nevada
Annual
Minimum
Temperature

1895-2008

Linear Trend 1895-present	+ 2.15 ± 0.51°F/100yr	
Linear Trend 1949-present	+ 4.26 ± 1.07°F/100yr	
Linear Trend 1975-present	+ 6.40 ± 2.41°F/100yr	
Warmest Year	38.7 °F (+ 2.1°F) in 2003	MEAN 36.5 °F
Coldest Year	33.3 °F (- 3.2 °F) in 1911	STDEV 1.03 °F
Jan-Dec	2008 37.6 °F (+ 1.1°F)	RANK 99 of 114

Winter
Temp

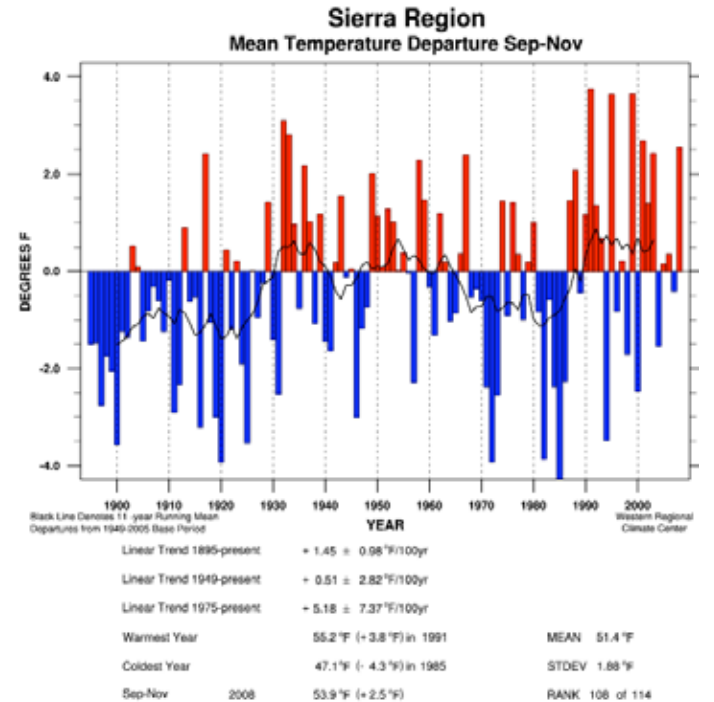
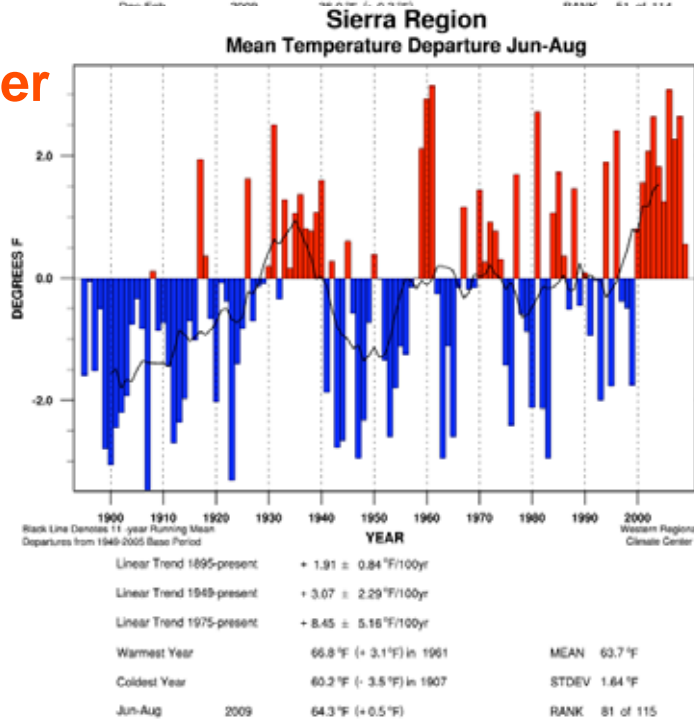
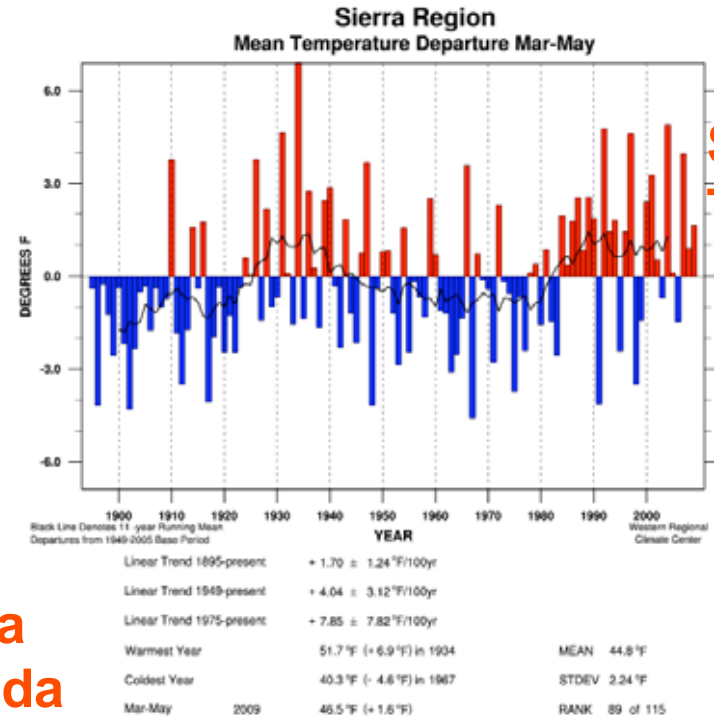
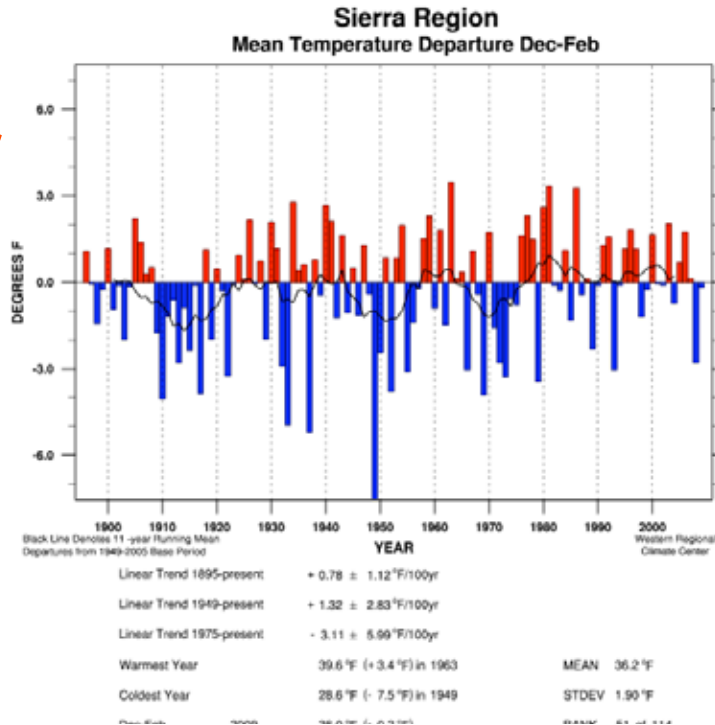
Thru
August
2009

Summer
Temp

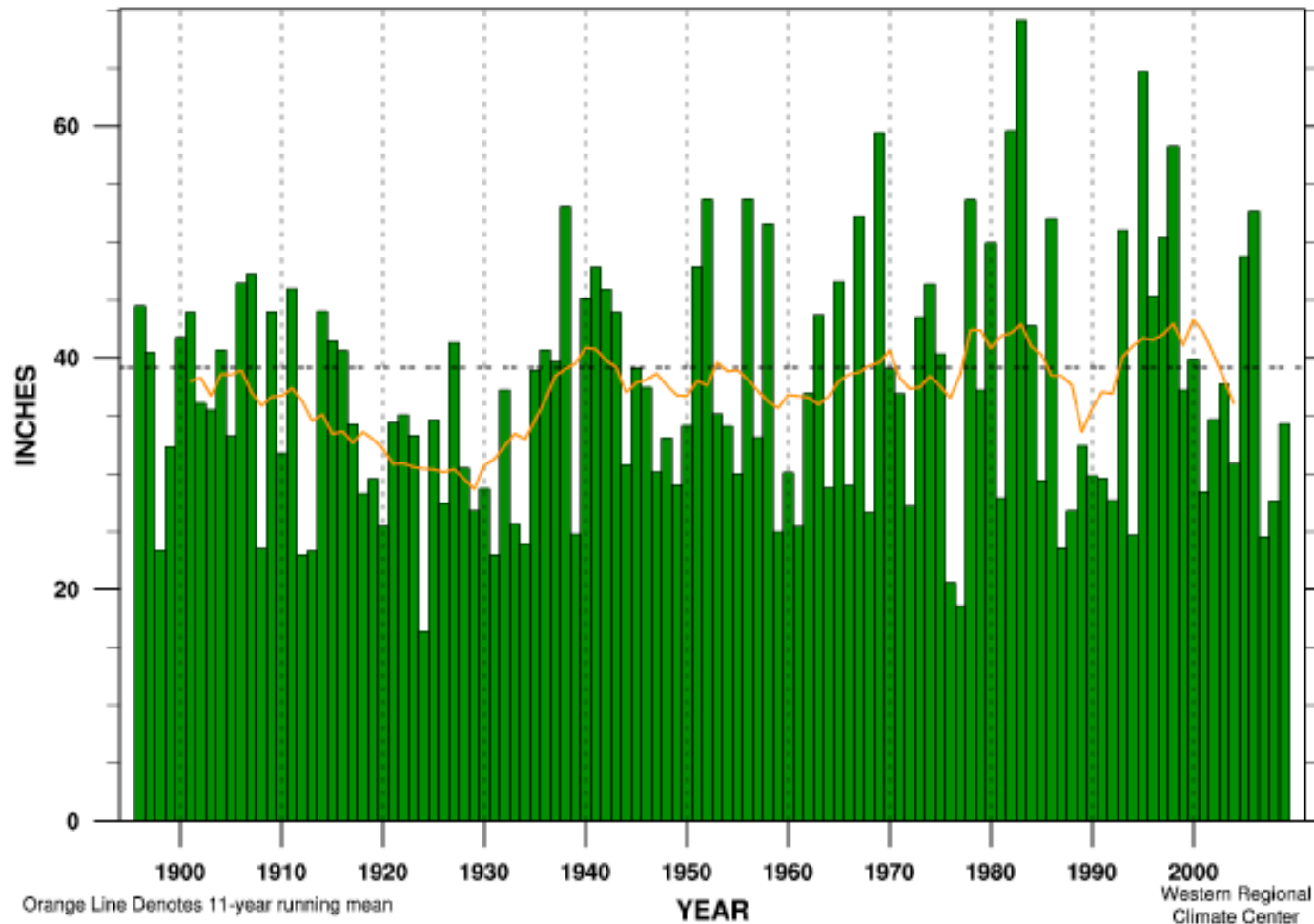
Spring
Temp

Fall
Temp

Sierra
Nevada



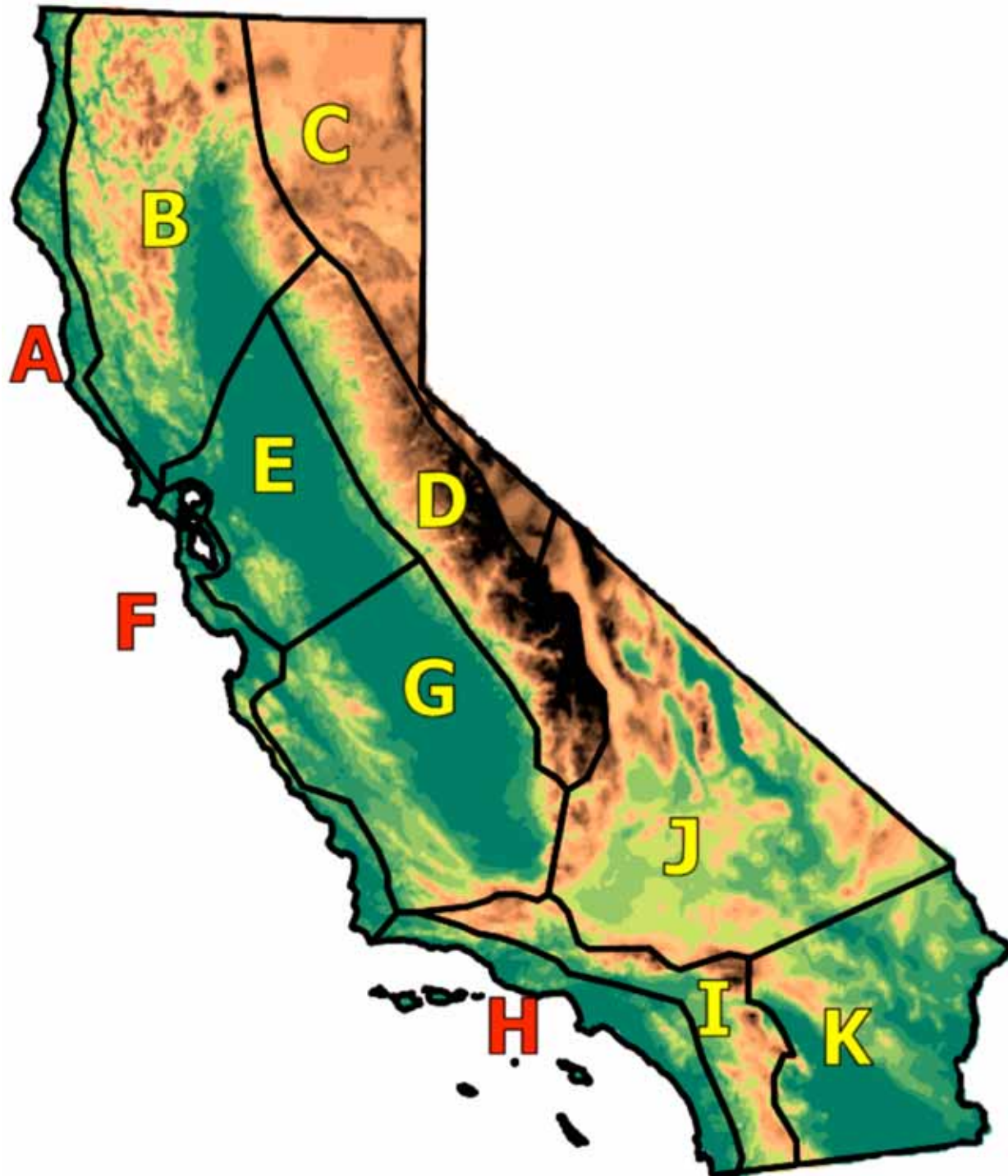
Sierra Region Precipitation Jul-Jun



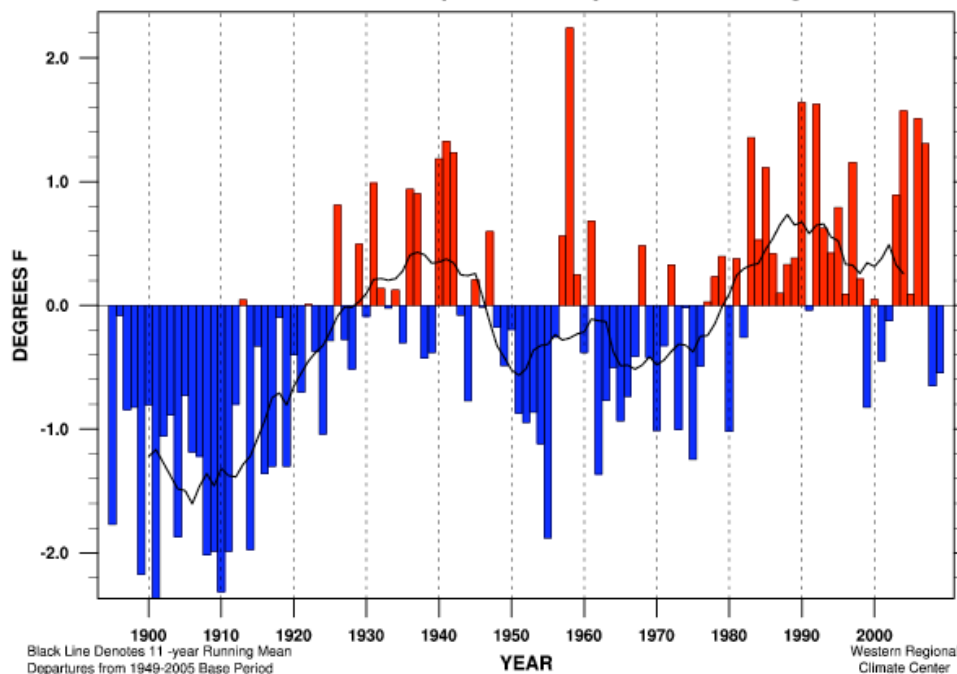
**Sierra Nevada
Winter
(July-June)
Precipitation**

**1894-95
thru
2008-09**

Linear Trend 1895-present	+ 4.53 ± 5.90 in.	(+ 11 ± 15%) per 100 yr	
Linear Trend 1949-present	- 0.23 ± 18.05 in.	(- 0 ± 46%) per 100 yr	
Linear Trend 1975-present	- 2.67 ± 48.40 in.	(- 6 ± 123%) per 100 yr	
Wettest Year	69.10 in. (176%) in 1983	MEAN	39.14 in.
Driest Year	16.36 in. (41%) in 1924	STDEV	12.05 in.
Jul-Jun	2009	34.31 in. (87%)	RANK 52 of 114



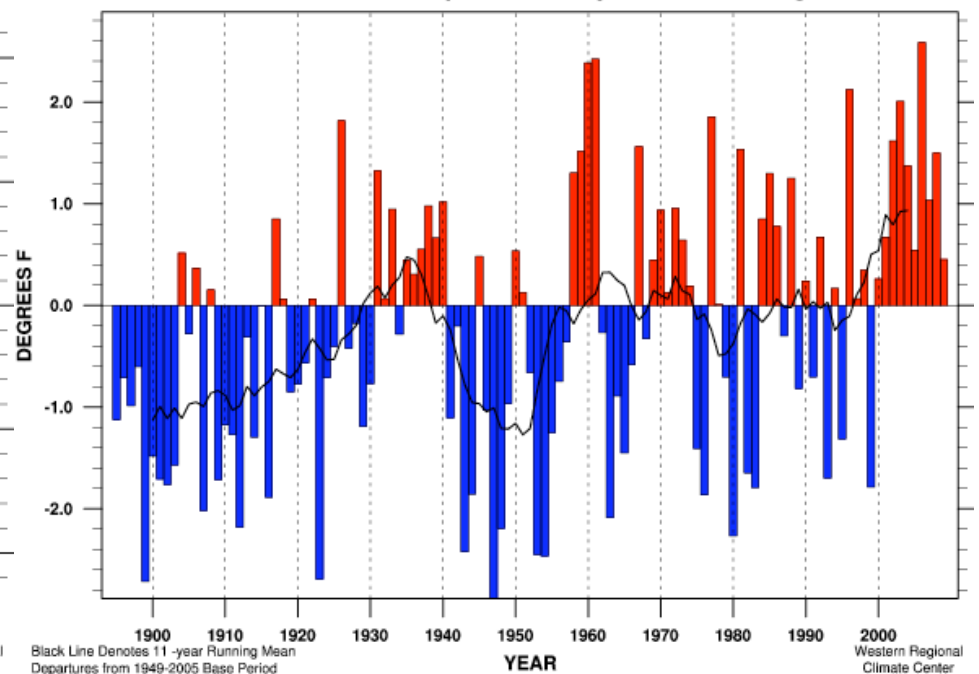
North Coast Region
Mean Temperature Departure Jun-Aug



Linear Trend 1895-present	+ 1.45 ± 0.45 °F/100yr
Linear Trend 1949-present	+ 2.05 ± 1.14 °F/100yr
Linear Trend 1975-present	+ 1.38 ± 2.60 °F/100yr
Warmest Year	63.9 °F (+ 2.2 °F) in 1958
Coldest Year	59.3 °F (- 2.4 °F) in 1901
Jun-Aug	2009 61.1 °F (- 0.5 °F)

MEAN	61.7 °F
STDEV	0.86 °F
RANK	40 of 115

North Region
Mean Temperature Departure Jun-Aug



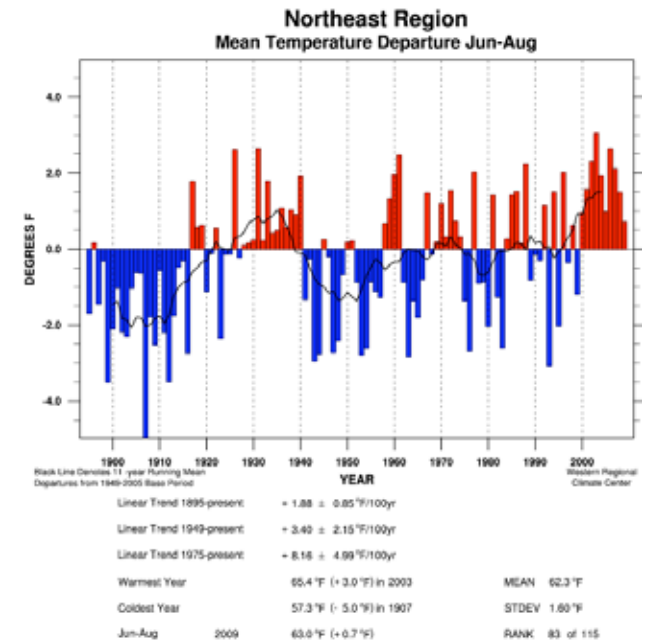
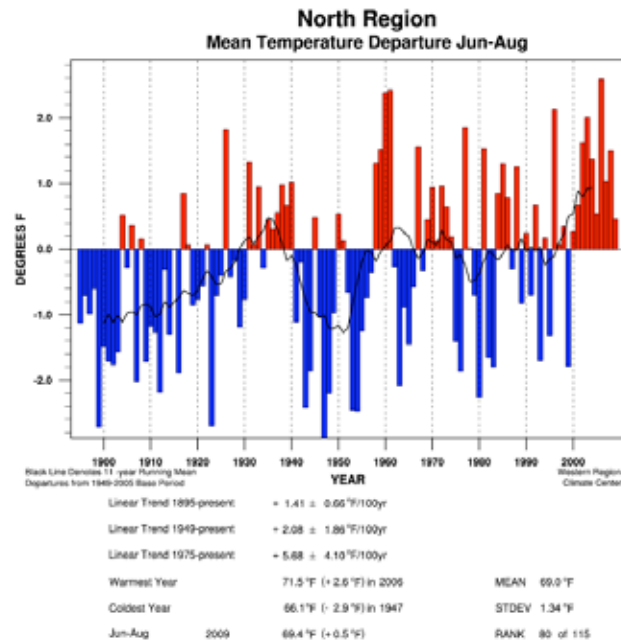
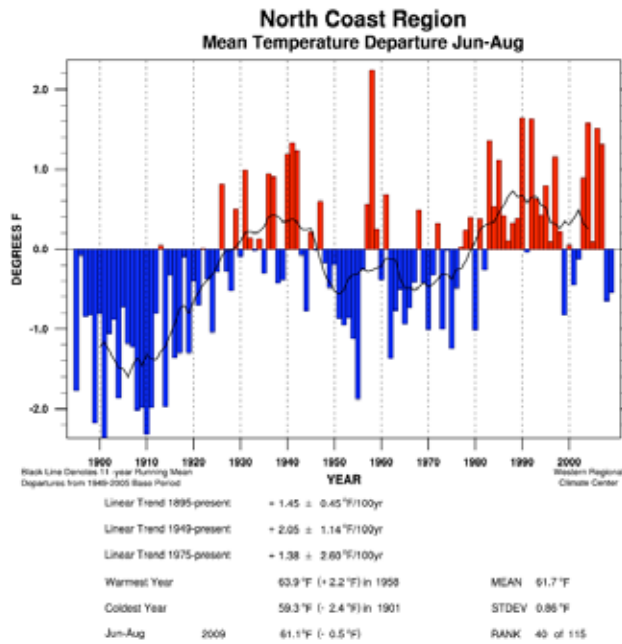
Linear Trend 1895-present	+ 1.41 ± 0.66 °F/100yr
Linear Trend 1949-present	+ 2.08 ± 1.86 °F/100yr
Linear Trend 1975-present	+ 5.68 ± 4.10 °F/100yr
Warmest Year	71.5 °F (+ 2.6 °F) in 2006
Coldest Year	66.1 °F (- 2.9 °F) in 1947
Jun-Aug	2009 69.4 °F (+ 0.5 °F)

MEAN	69.0 °F
STDEV	1.34 °F
RANK	80 of 115

**Mean Temperature
Summer (JJA)**

North Coast

North Interior

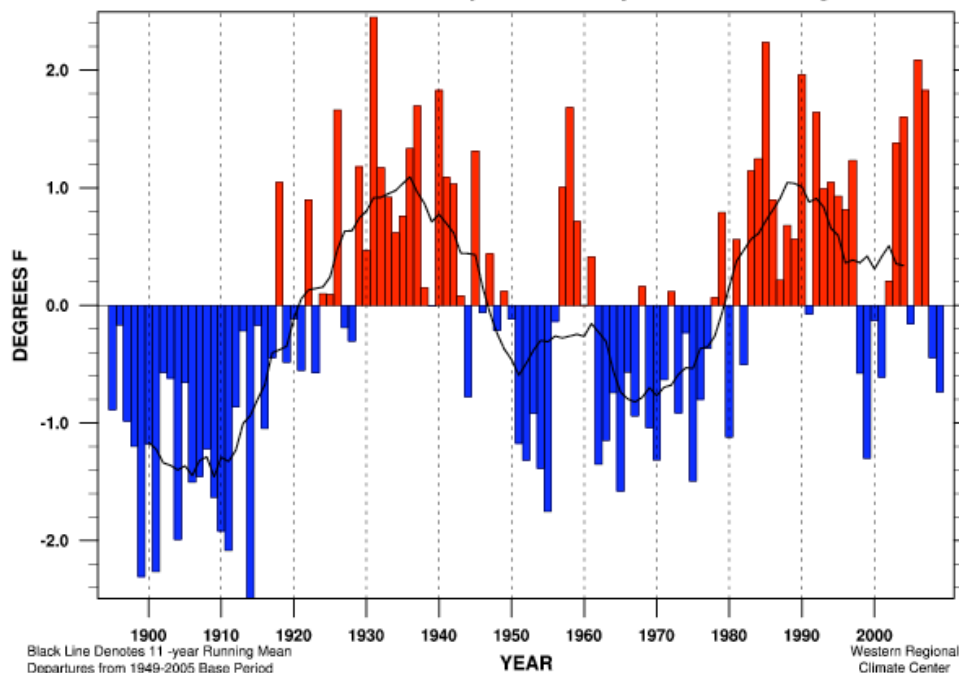


Mean Temperature Summer (JJA) North Interior

North Coast

Northeast

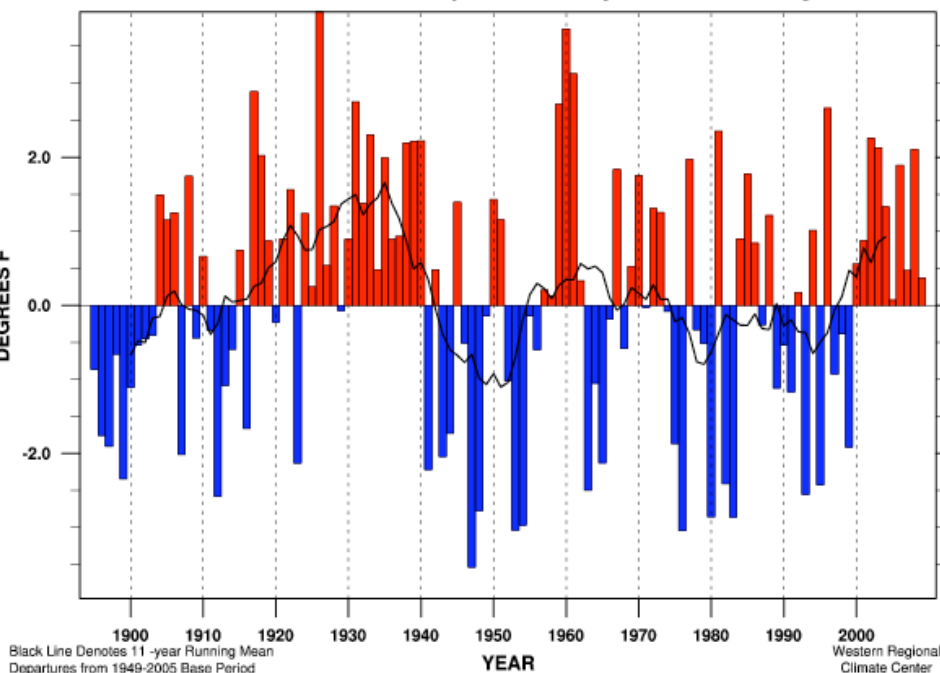
North Coast Region
Maximum Temperature Departure Jun-Aug



Linear Trend 1895-present	+ 1.22 ± 0.58 °F/100yr
Linear Trend 1949-present	+ 2.56 ± 1.43 °F/100yr
Linear Trend 1975-present	+ 1.73 ± 3.43 °F/100yr
Warmest Year	75.3 °F (+ 2.4 °F) in 1931
Coldest Year	70.3 °F (- 2.5 °F) in 1914
Jun-Aug	2009 72.1 °F (- 0.7 °F)

MEAN	72.8 °F
STDEV	1.05 °F
RANK	35 of 115

North Region
Maximum Temperature Departure Jun-Aug



Linear Trend 1895-present	+ 0.21 ± 0.95 °F/100yr
Linear Trend 1949-present	+ 1.03 ± 2.49 °F/100yr
Linear Trend 1975-present	+ 6.42 ± 5.46 °F/100yr
Warmest Year	89.6 °F (+ 4.0 °F) in 1926
Coldest Year	82.1 °F (- 3.5 °F) in 1947
Jun-Aug	2009 86.1 °F (+ 0.4 °F)

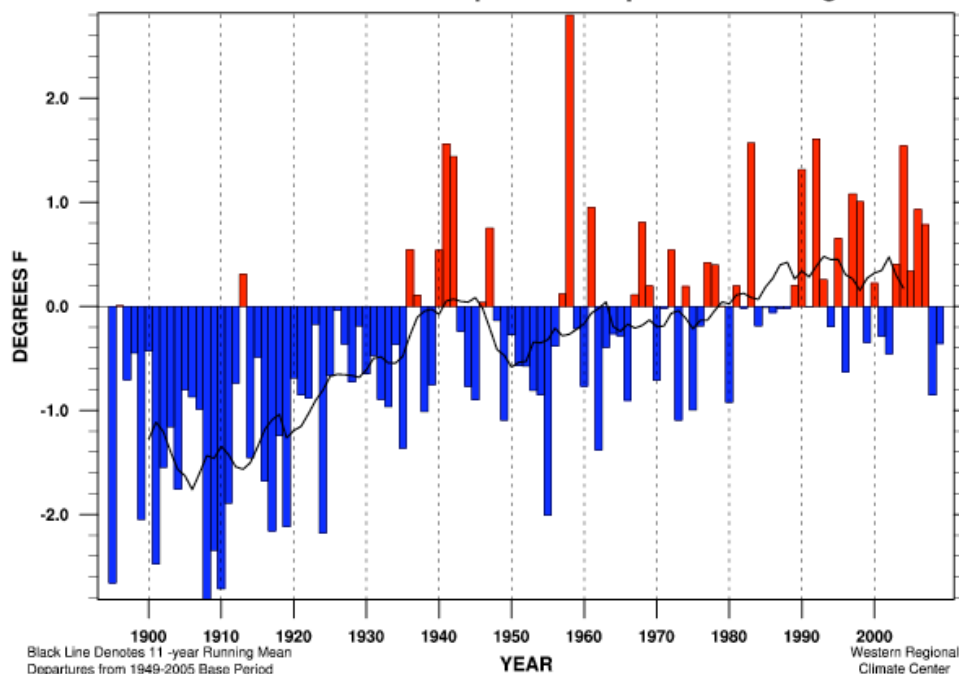
MEAN	85.7 °F
STDEV	1.73 °F
RANK	61 of 115

Mean Maximum Temperature Summer (JJA)

North Coast

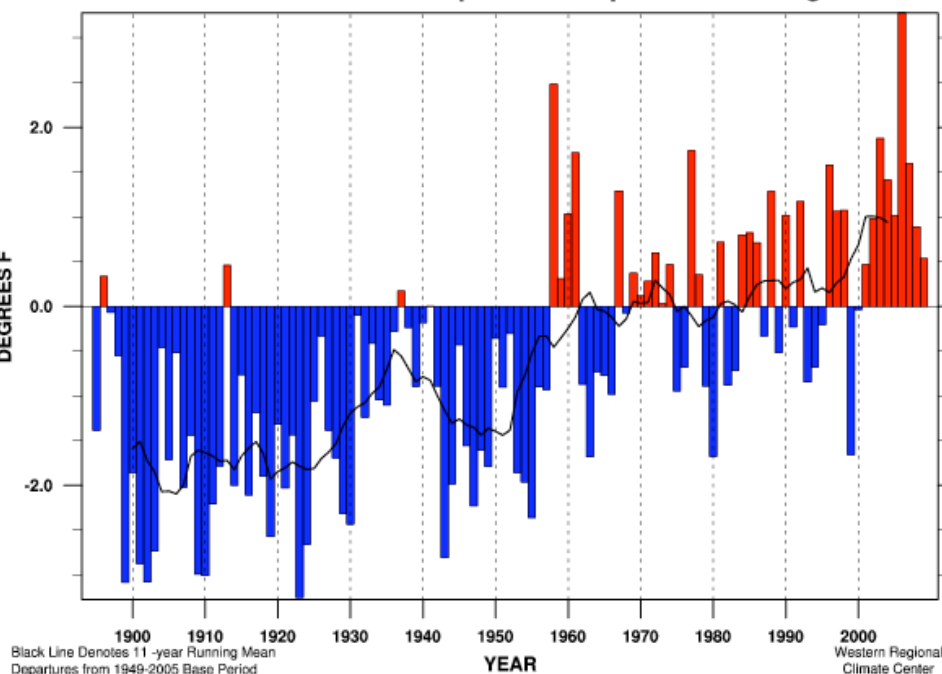
North Interior

North Coast Region
Minimum Temperature Departure Jun-Aug



Linear Trend 1895-present	+ 1.68 ± 0.45 °F/100yr		
Linear Trend 1949-present	+ 1.53 ± 1.13 °F/100yr		
Linear Trend 1975-present	+ 1.04 ± 2.34 °F/100yr		
Warmest Year	53.4 °F (+ 2.8 °F) in 1958	MEAN	50.6 °F
Coldest Year	47.7 °F (- 2.8 °F) in 1908	STDEV	0.83 °F
Jun-Aug	2009	RANK	59 of 115

North Region
Minimum Temperature Departure Jun-Aug

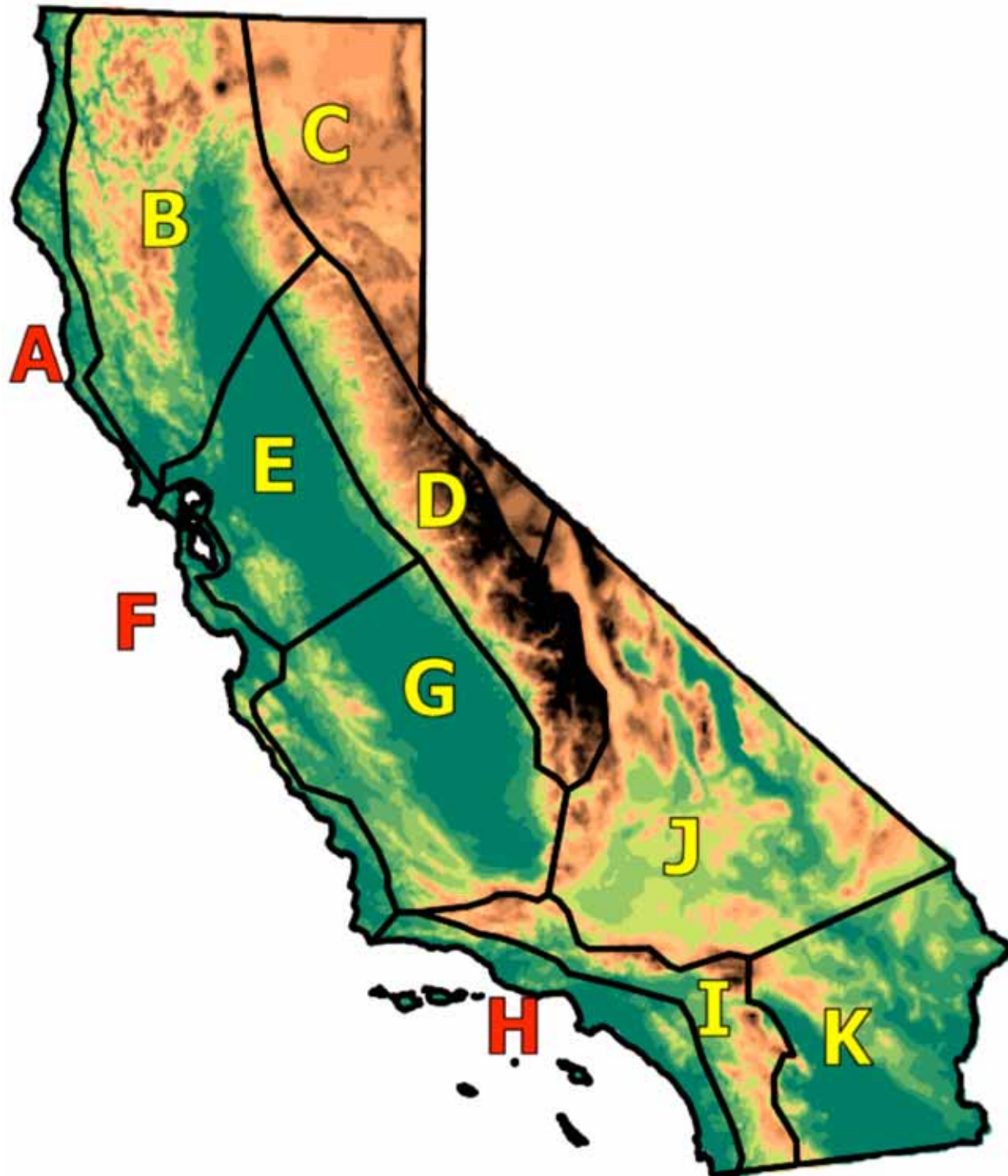


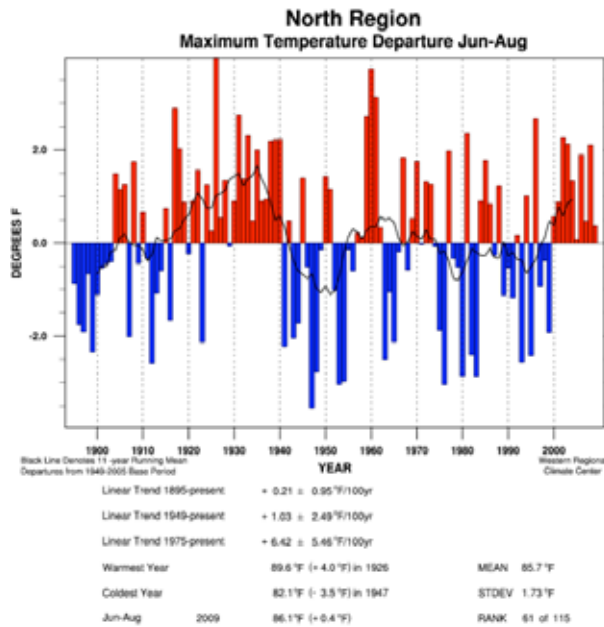
Linear Trend 1895-present	+ 2.61 ± 0.57 °F/100yr		
Linear Trend 1949-present	+ 3.12 ± 1.52 °F/100yr		
Linear Trend 1975-present	+ 4.93 ± 3.38 °F/100yr		
Warmest Year	55.5 °F (+ 3.3 °F) in 2006	MEAN	52.2 °F
Coldest Year	49.0 °F (- 3.3 °F) in 1923	STDEV	1.19 °F
Jun-Aug	2009	RANK	92 of 115

Mean Minimum Temperature Summer (JJA)

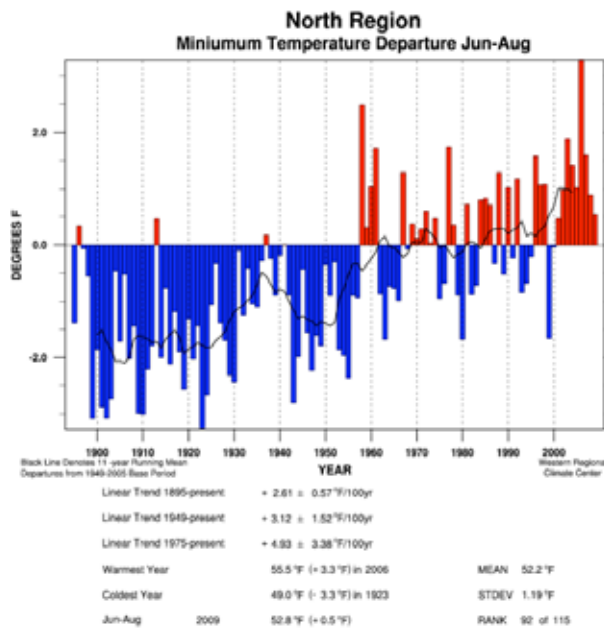
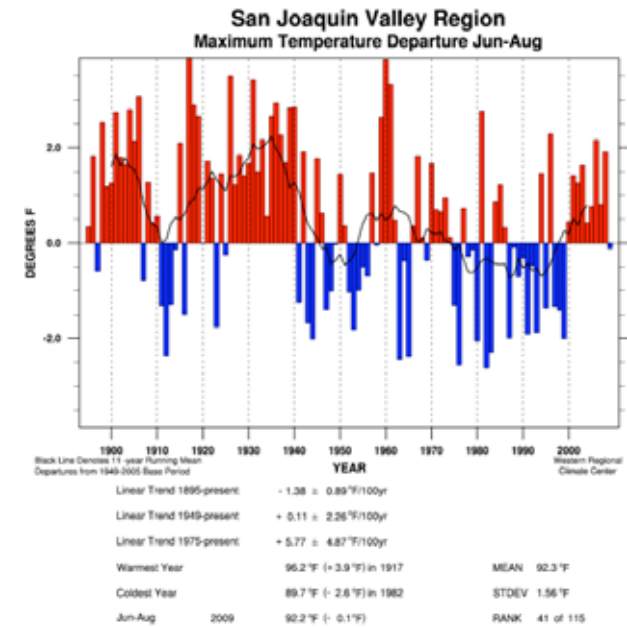
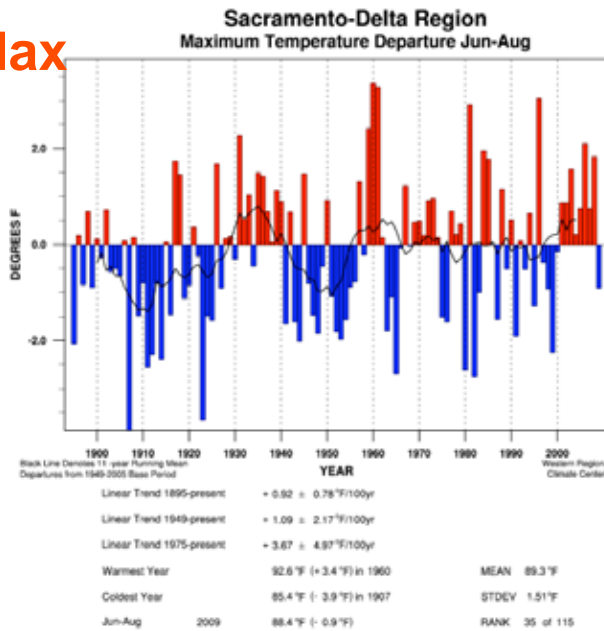
North Coast

North Interior

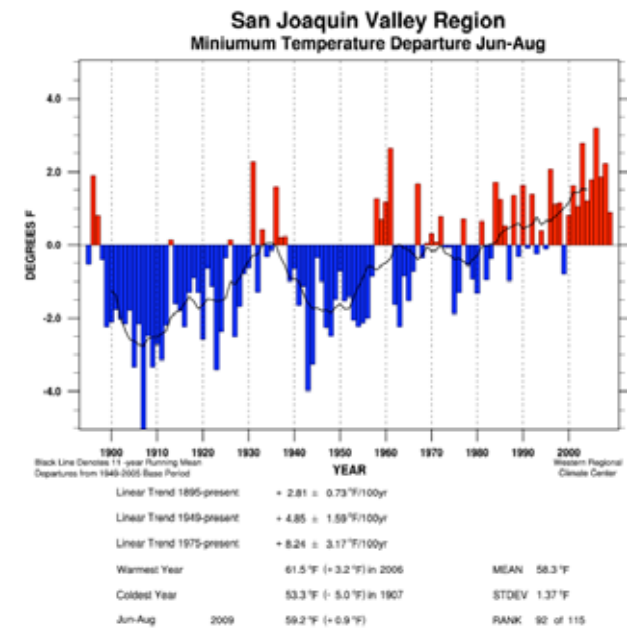
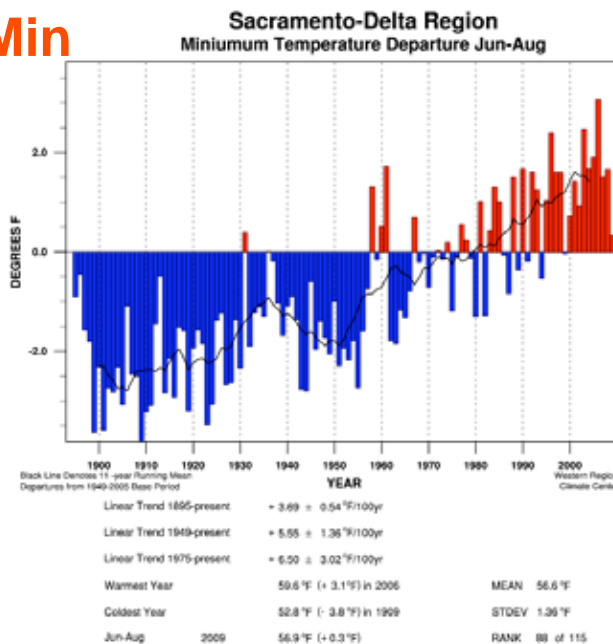




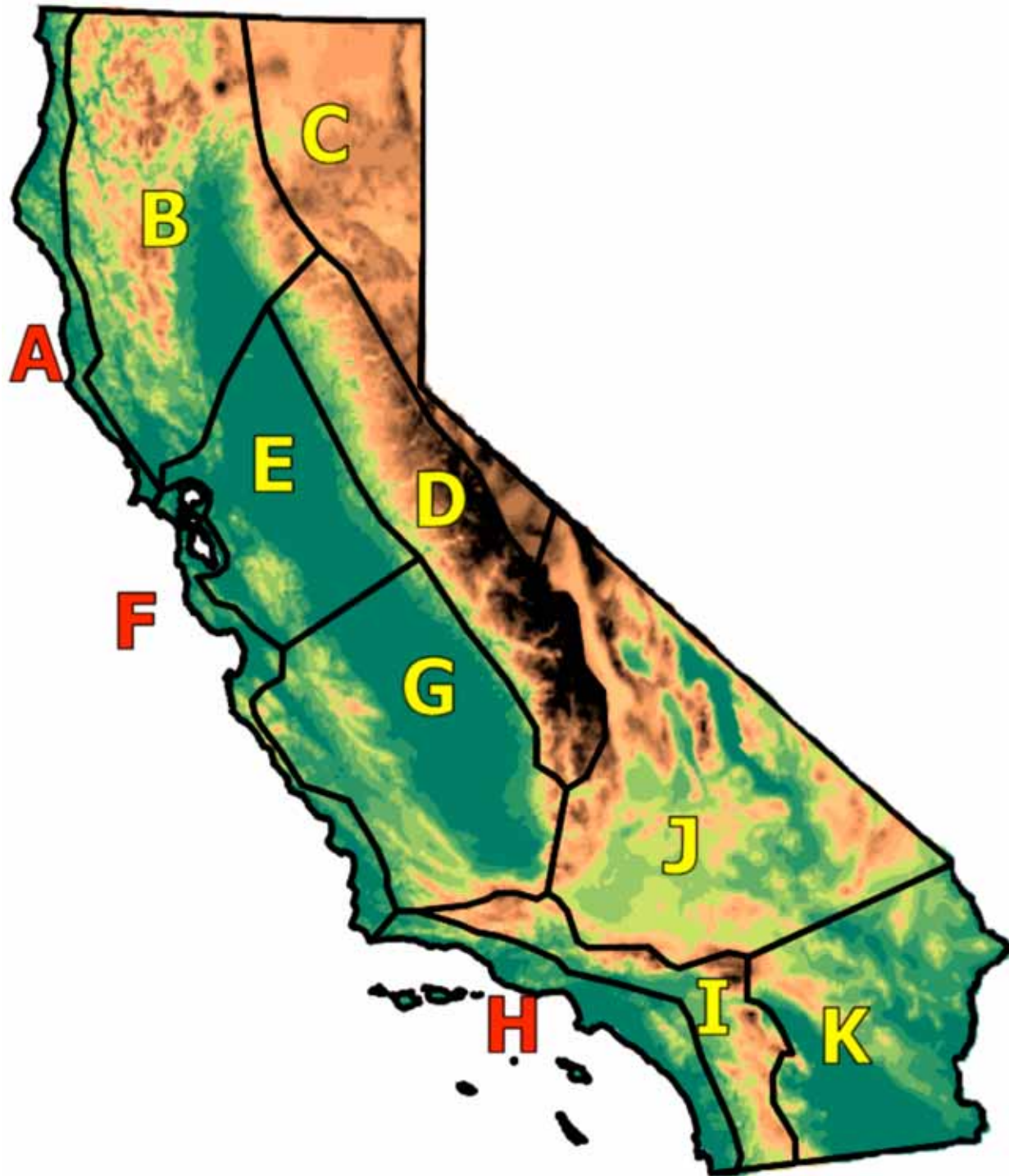
Max



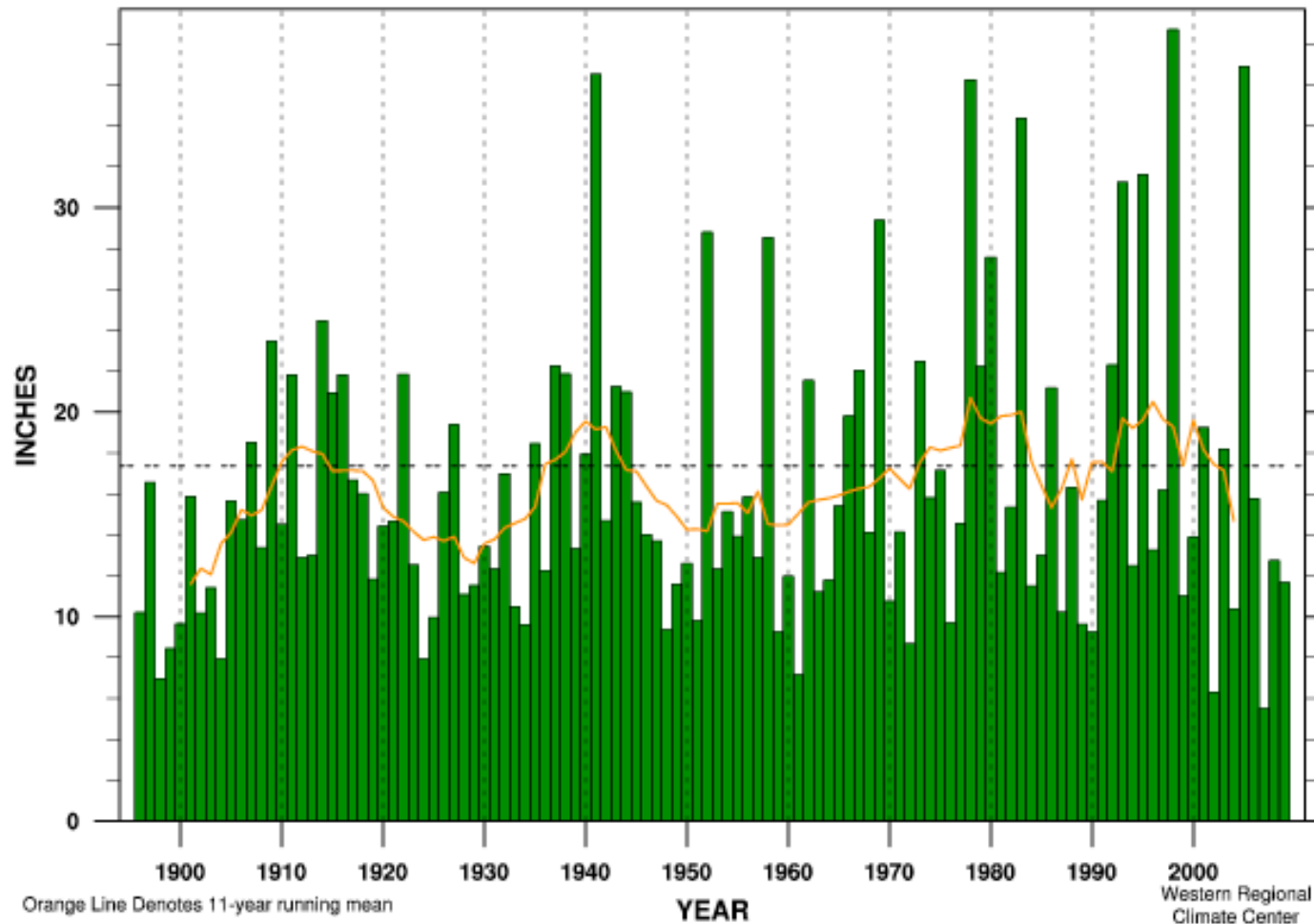
Min



Interior California Summer (JJA) Max and Min Temperature
Northern / Sacramento R Bay-Delta Southern / San Joaquin R



South Coast Region Precipitation Jul-Jun



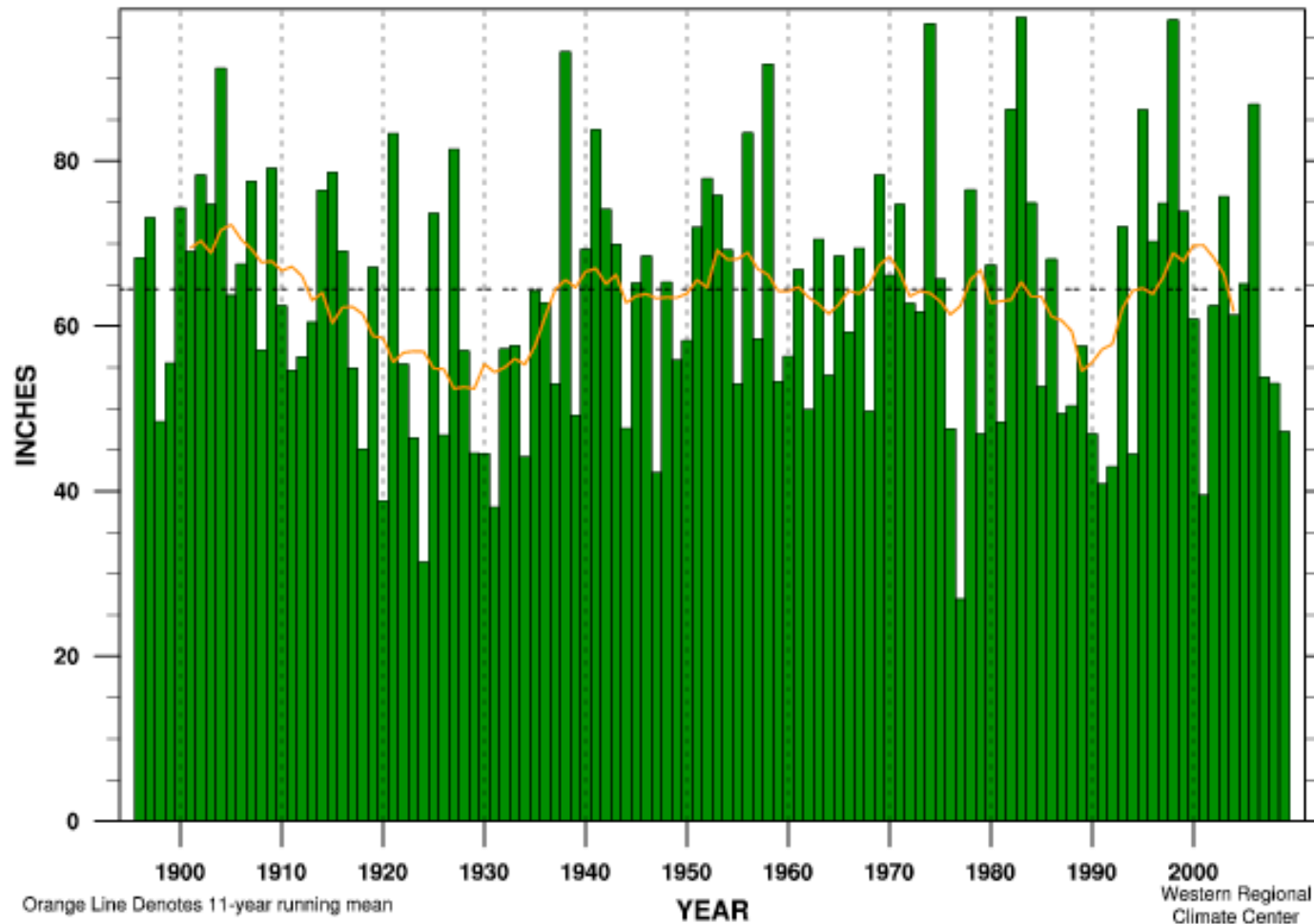
**July-June
Precipitation**

**South
Coastal
California**

**1895-1896
thru
2008-2009**

Linear Trend 1895-present	+ 3.47 ± 3.89 in.	(+ 19 ± 22%) per 100 yr	
Linear Trend 1949-present	+ 2.98 ± 12.15 in.	(+ 17 ± 69%) per 100 yr	
Linear Trend 1975-present	-13.40 ± 33.11 in.	(- 77 ± 190%) per 100 yr	
Wettest Year	38.71 in. (222%) in 1998	MEAN	17.38 in.
Driest Year	5.49 in. (31%) in 2007	STDEV	8.11 in.
Jul-Jun	2009	11.68 in. (67%)	RANK 31 of 114

North Coast Region Precipitation Jul-Jun



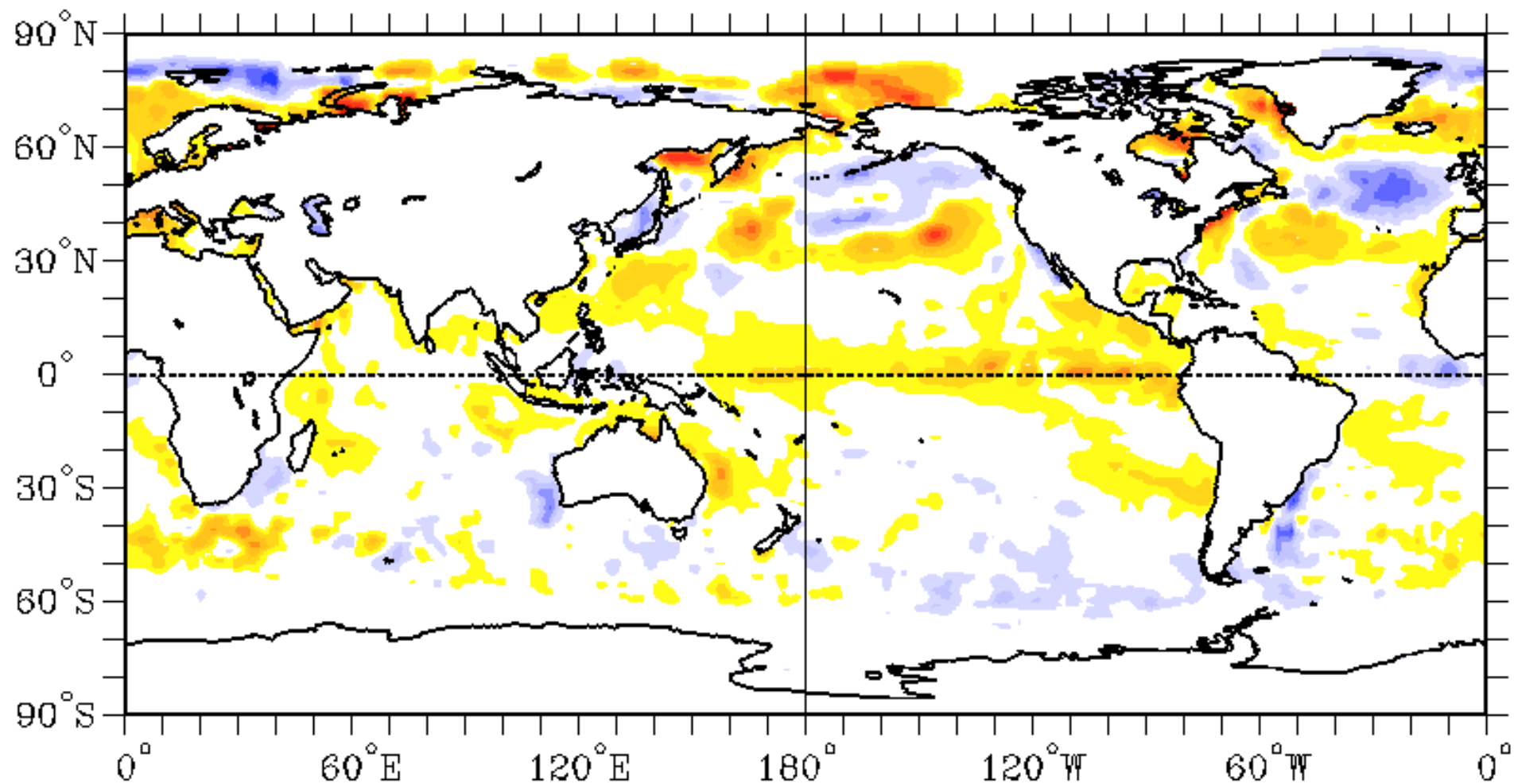
July-June
Precipitation

North
Coastal
California

1895-1896
thru
2008-2009

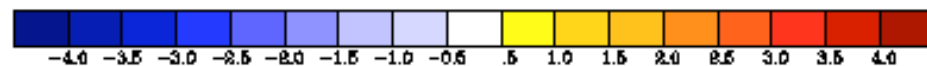
Linear Trend 1895-present	- 0.83 ± 8.36 in.	(- 1 ± 12%) per 100 yr	
Linear Trend 1949-present	- 8.65 ± 23.02 in.	(- 13 ± 35%) per 100 yr	
Linear Trend 1975-present	+18.88 ± 62.01 in.	(+ 29 ± 96%) per 100 yr	
Wettest Year	97.40 in. (151%) in 1983	MEAN	64.42 in.
Driest Year	26.89 in. (41%) in 1977	STDEV	15.48 in.
Jul-Jun	2009	47.19 in. (73%)	RANK 18 of 114

Sea Surface Temperature Departure (C) 2009 Aug 23-29

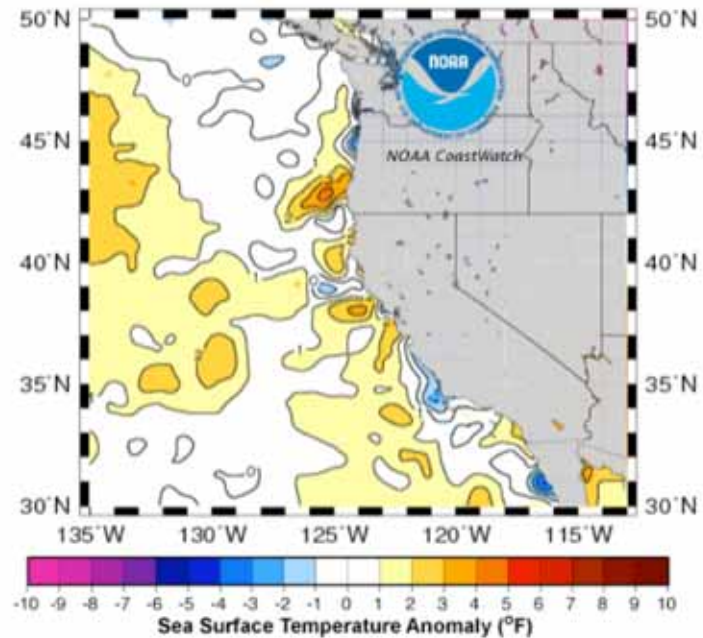


SST ANOM 8/23/09- 8/29/09

Base Period: 1982-96



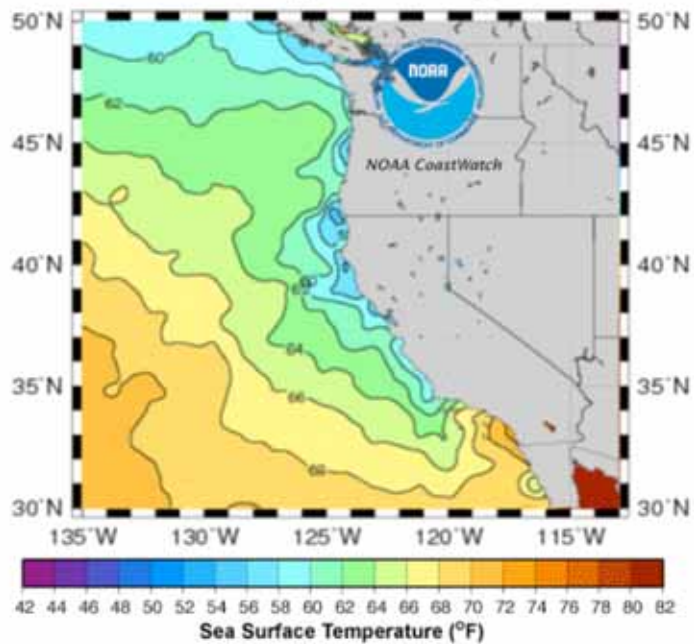
Sea Surface Temperature Anomaly - August 2009
Based on NOAA AVHRR SST data and AVHRR Pathero Climatology



August 2009

Sea Surface Temperature
Departure

Sea Surface Temperature - August 2009



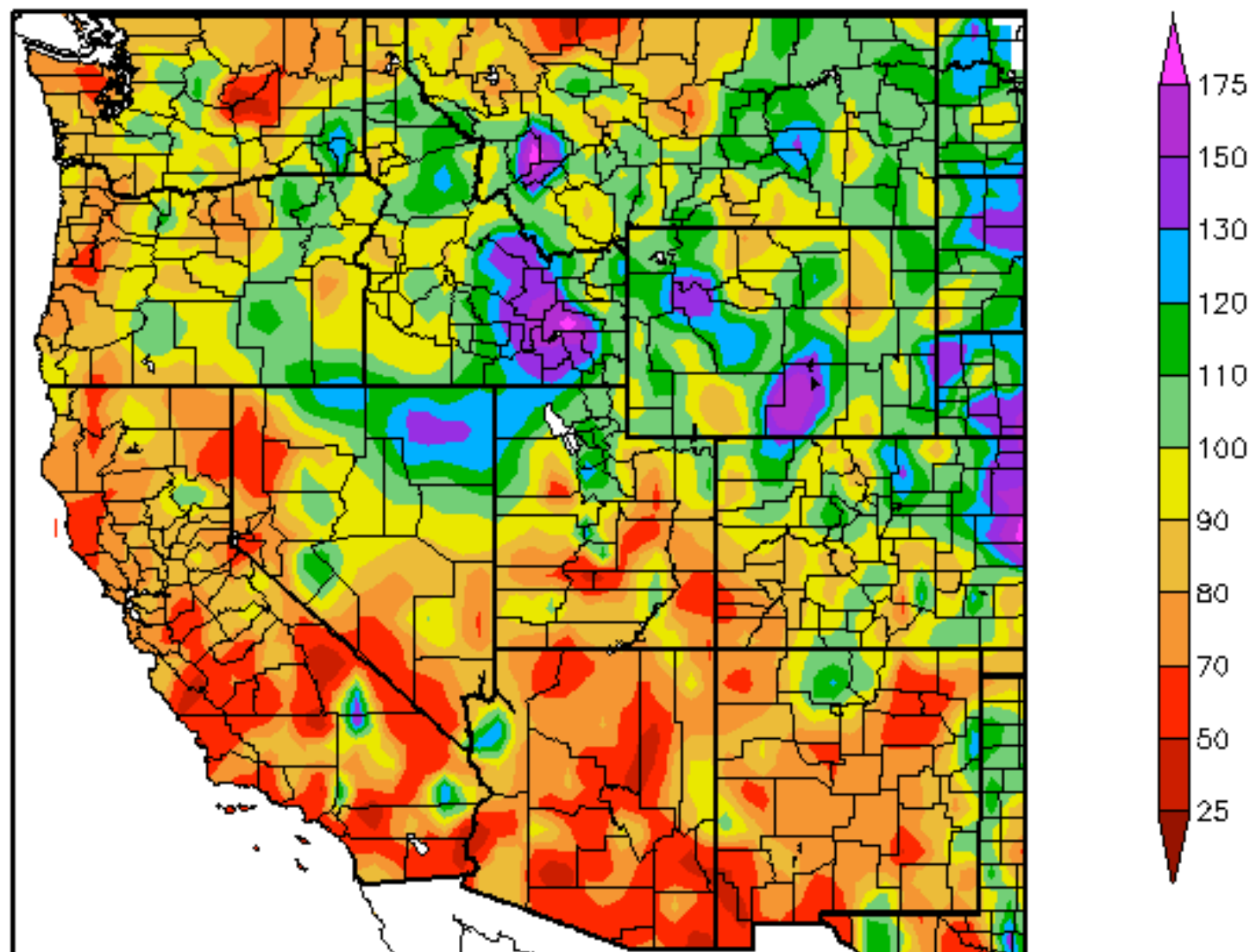
Sea Surface Temperature

From NOAA Coast Watch

**Water Year
Precipitation
Pct of Ave**

**2008 Oct 01
Thru
2009 Sep 06**

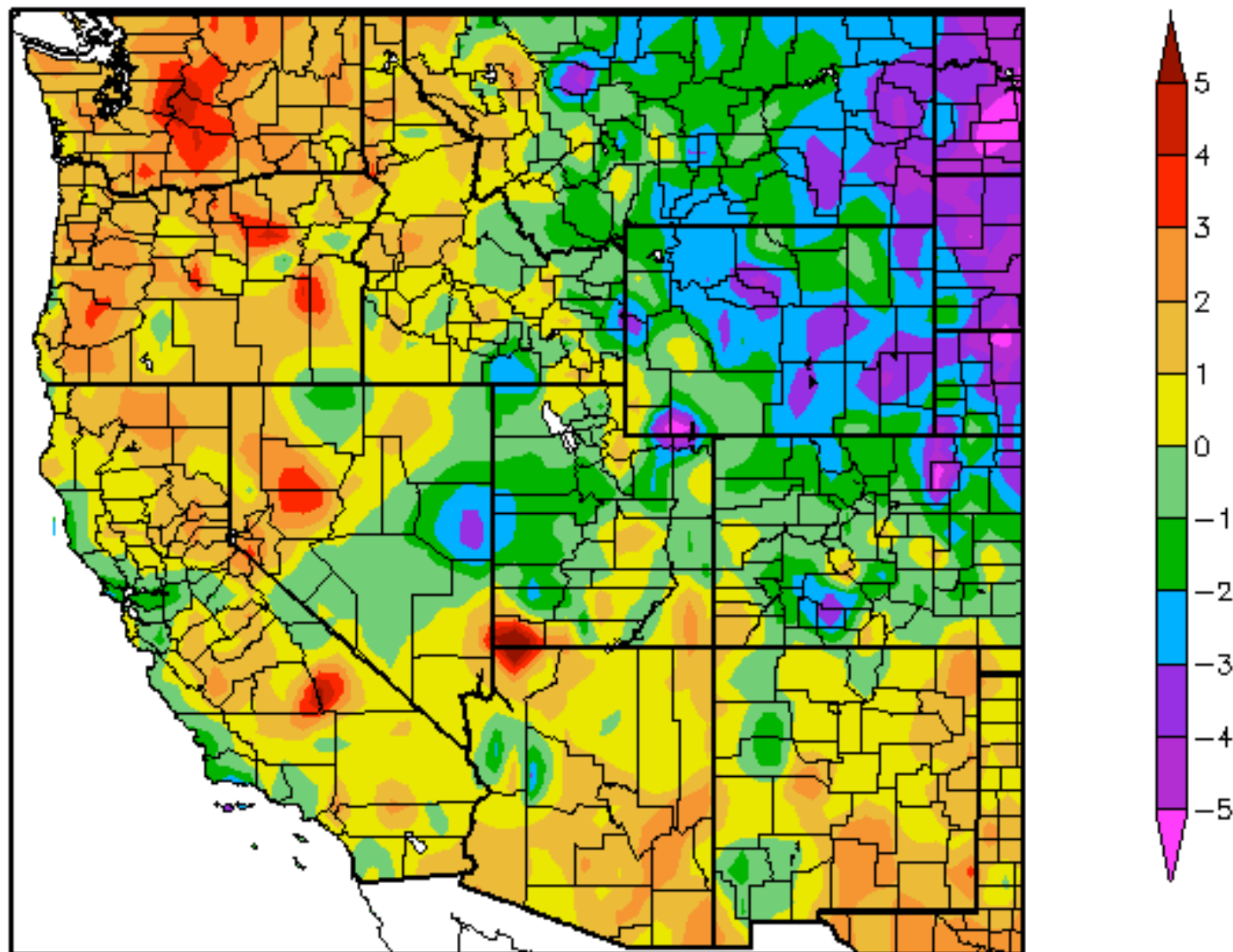
Percent of Normal Precipitation (%)
10/1/2008 – 9/6/2009



**Summer
Temperature
Departure**

**2009
Jun-Jul-Aug**

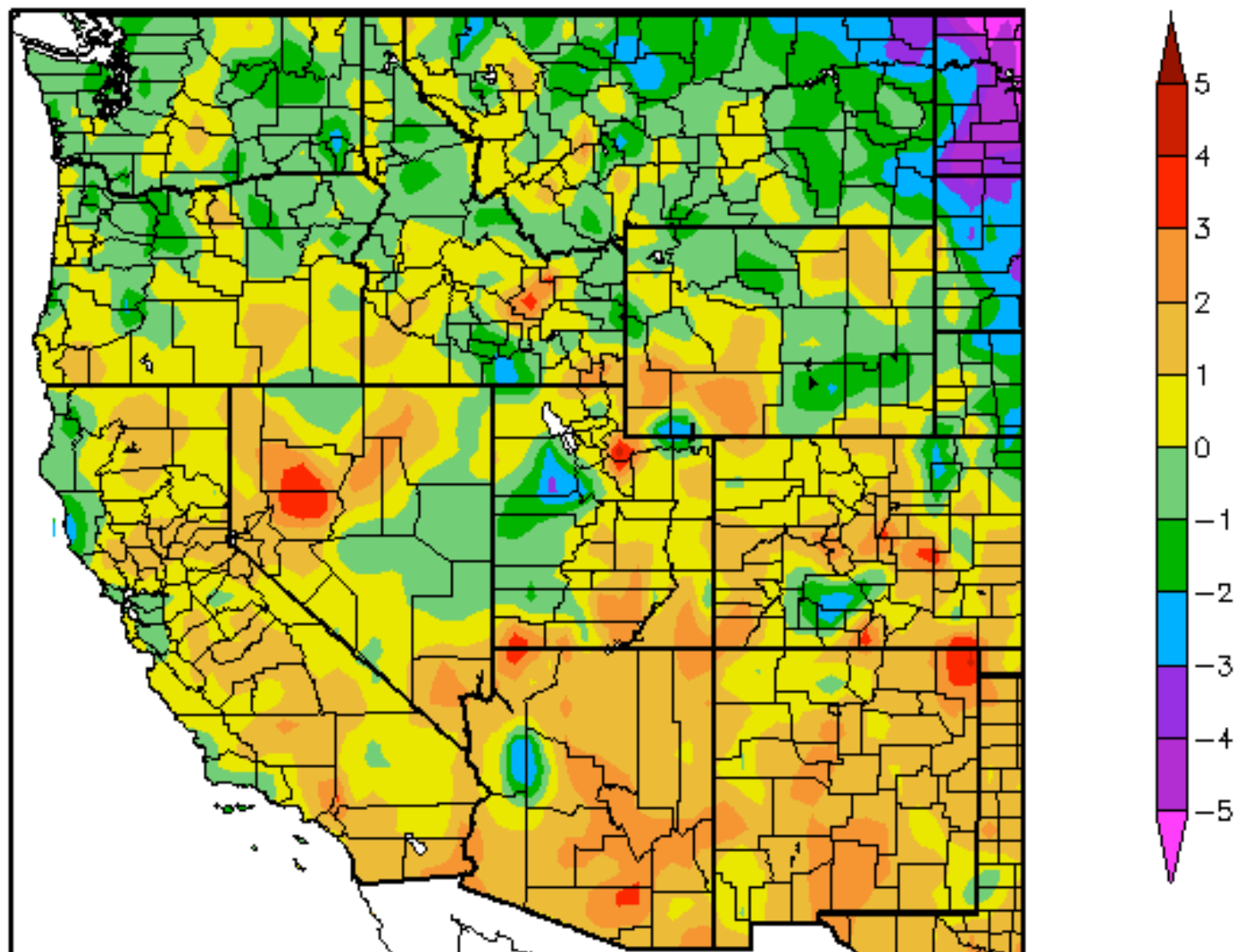
Departure from Normal Temperature (F)
6/1/2009 – 8/31/2009



**Water Year
Temperature
Departure**

**2008 Oct 01
Thru
2009 Sep 06**

Departure from Normal Temperature (F)
10/1/2008 – 9/6/2009



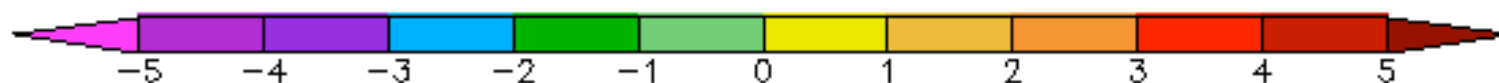
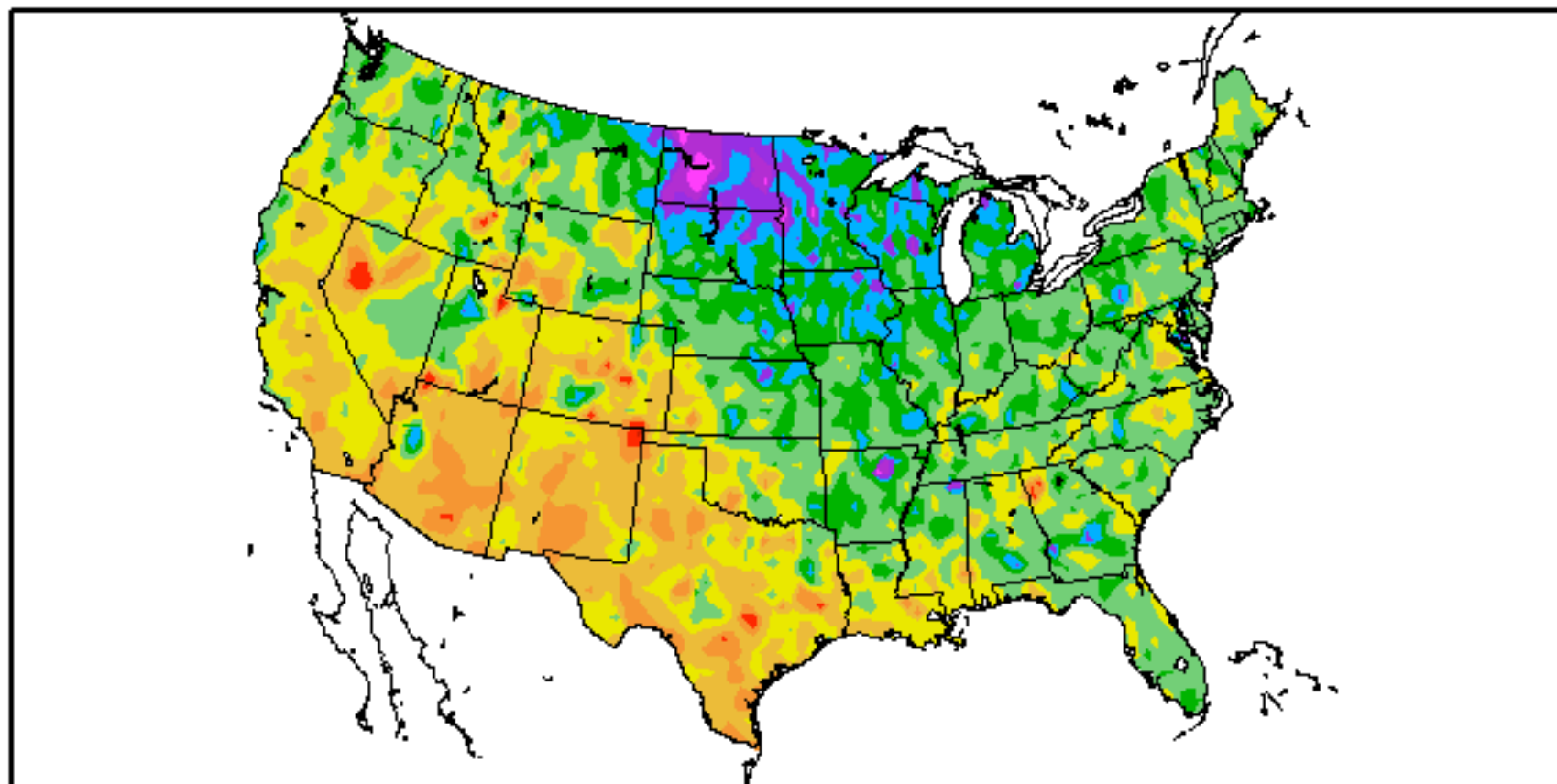
Water Year

2008 Oct 01

Thru

2009 Sep 06

Departure from Normal Temperature (F)
10/1/2008 – 9/6/2009



Generated 9/7/2009 at HPRCC using provisional data.

NOAA Regional Climate Centers

North American Freezing Level Tracker (not quite online yet)

North American Freezing Level Tracker

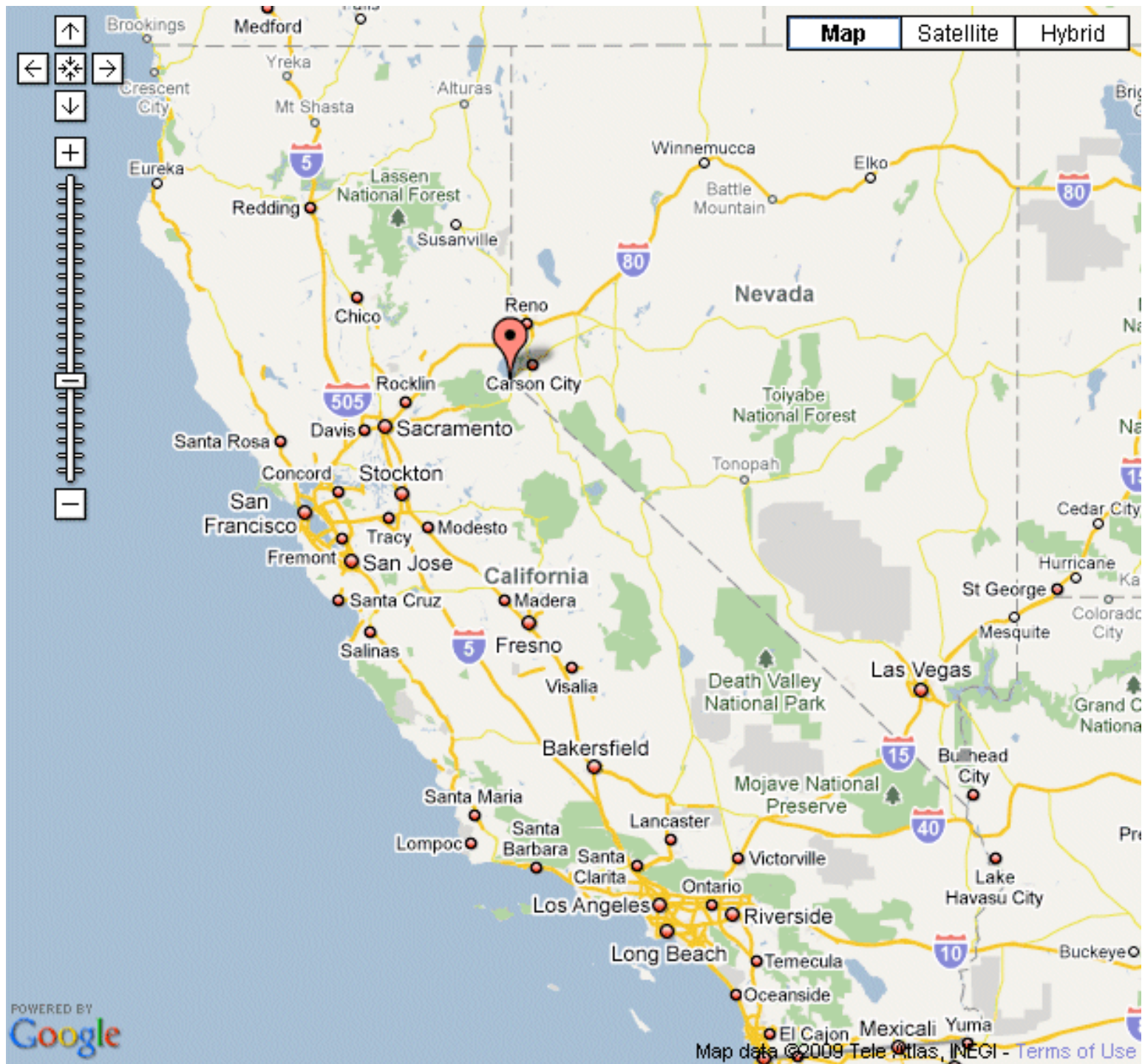
About <<
Description -
Click anywhere on the map to place a marker. It can then be dragged around the map. Use the Products panel on the right to generate products for the marker's location.
Settings +

Map

Map Satellite Hybrid

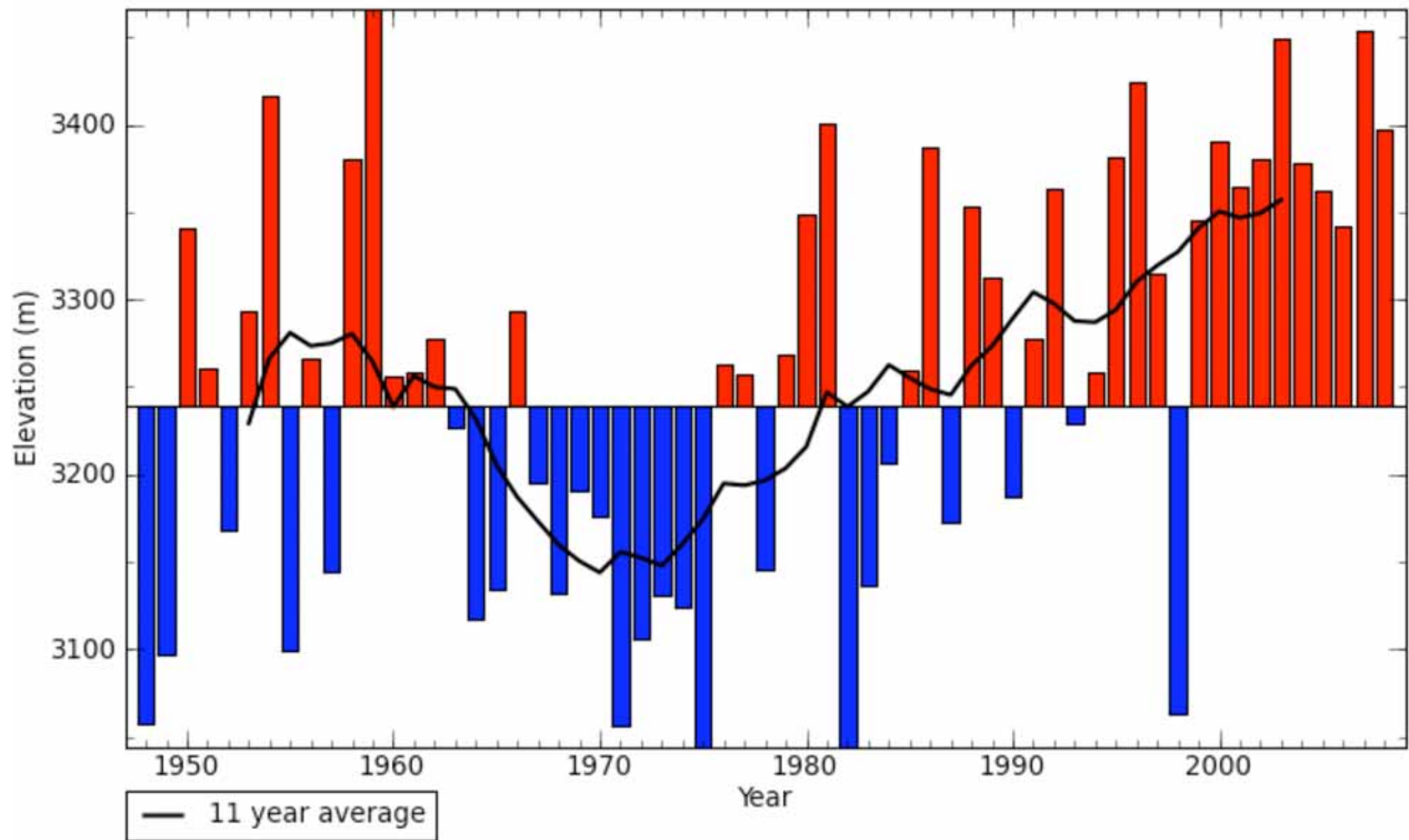
Map data ©2009 Tele Atlas, INEGI, Europa Technologies - [Terms of Use](#)

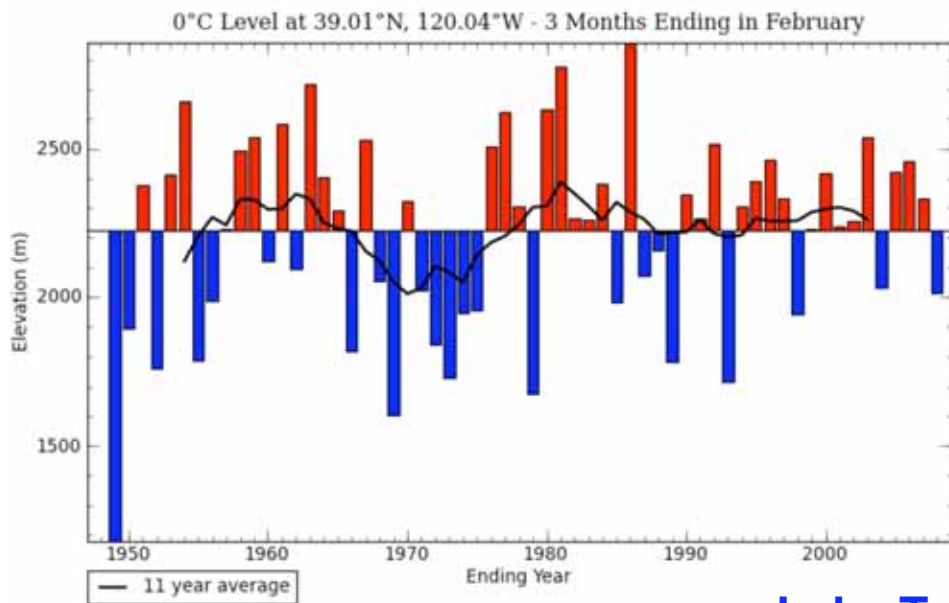
Products >>
Monthly Bar Graph -
Lat:
Lon:
Span: 1 Month ▾
End Month: Jan ▾
Level: 0 C ▾
Running average: None ▾
Go
Last 12 Months +



Lake Tahoe Annual Mean Freezing Level

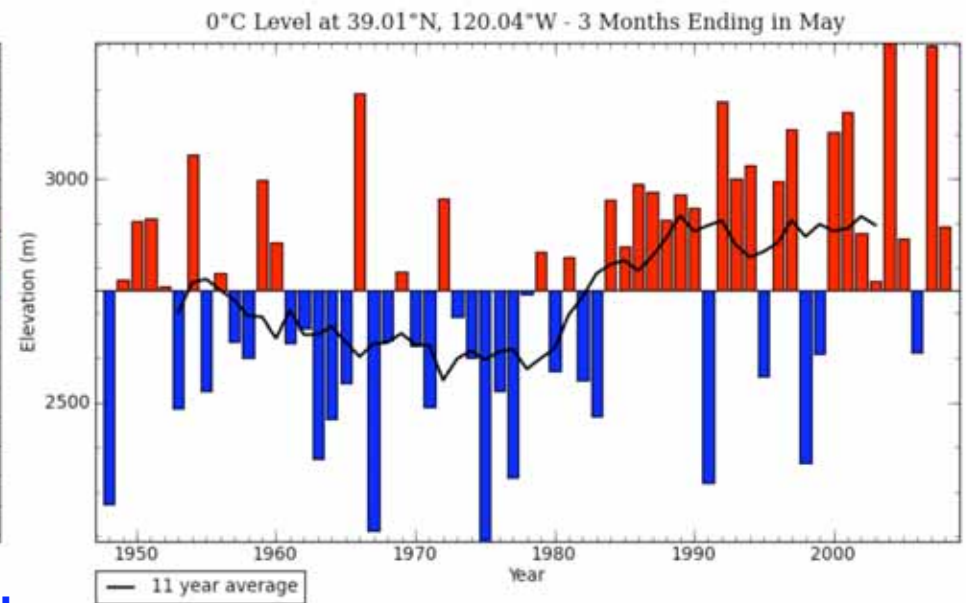
0°C Level at 39.01°N, 120.04°W - 12 Months Ending in December



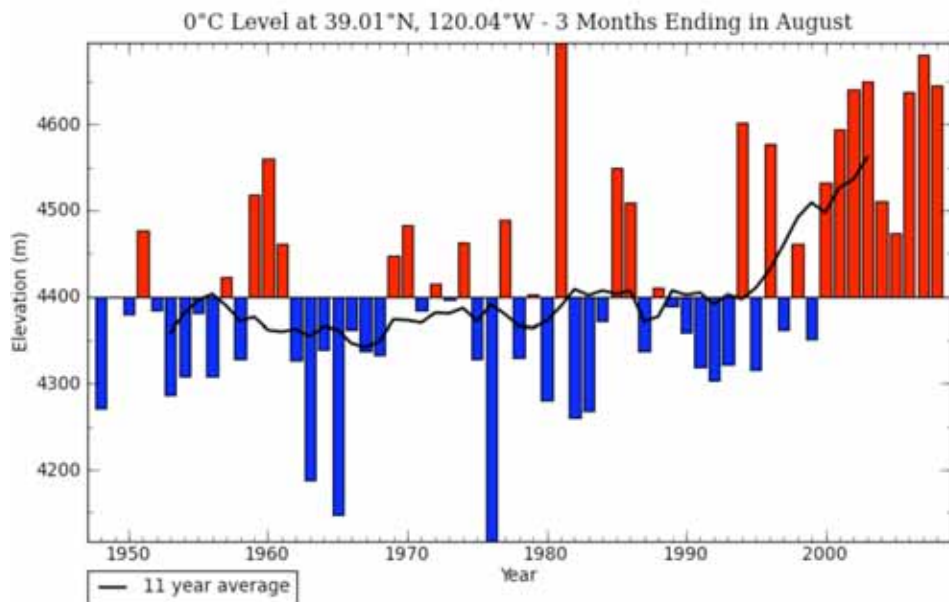


Winter

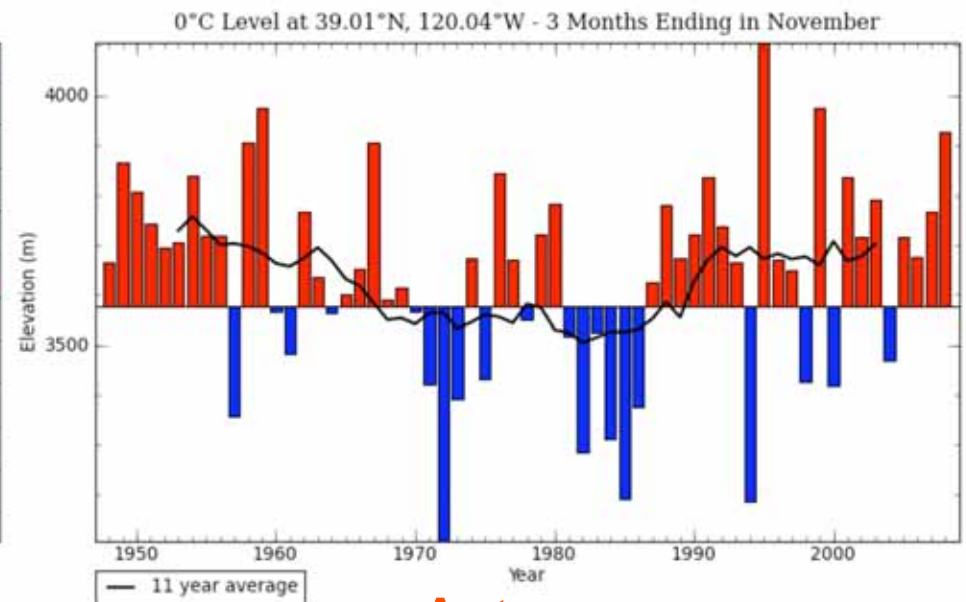
Lake Tahoe
Freezing Level 1948-2008



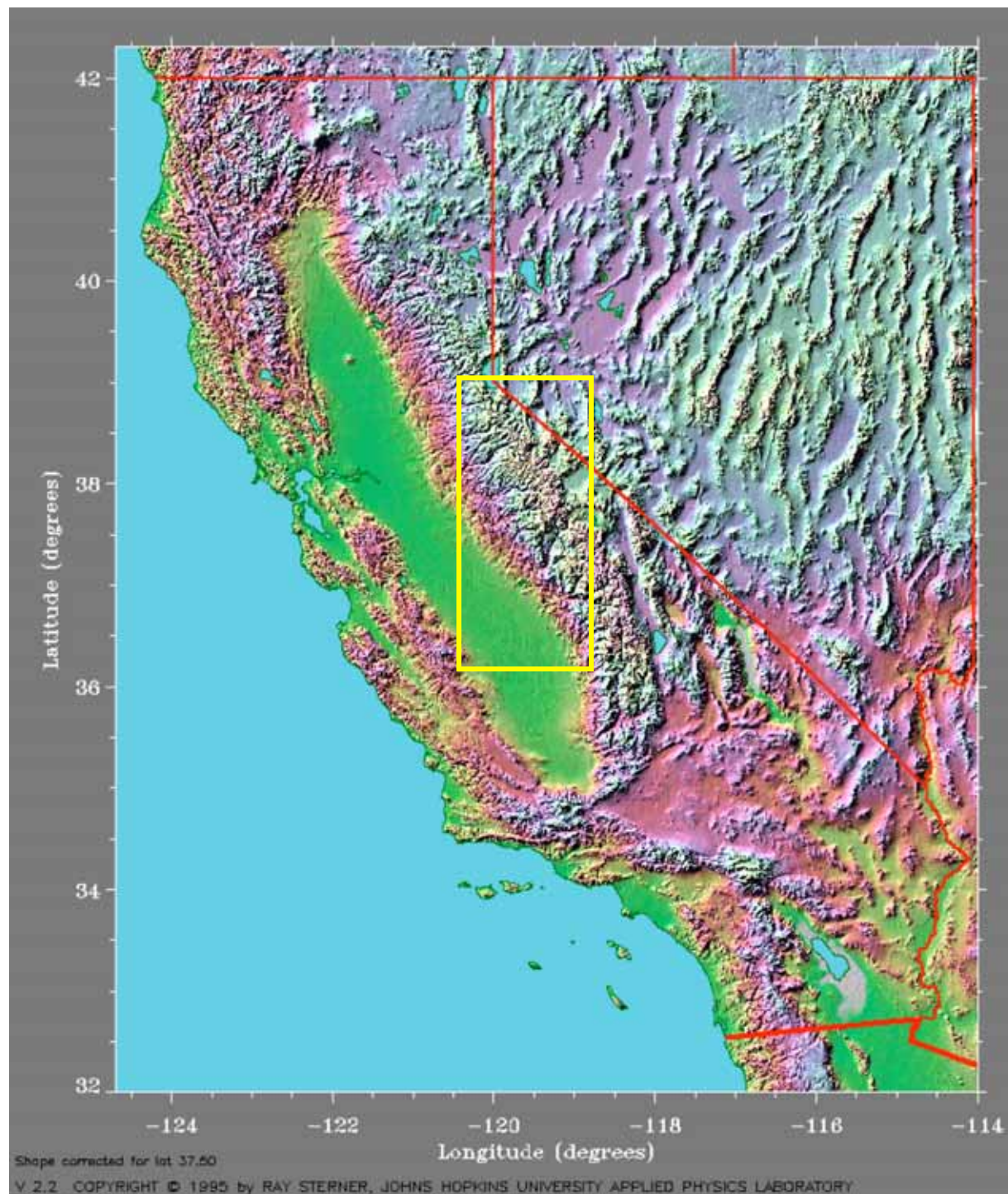
Spring



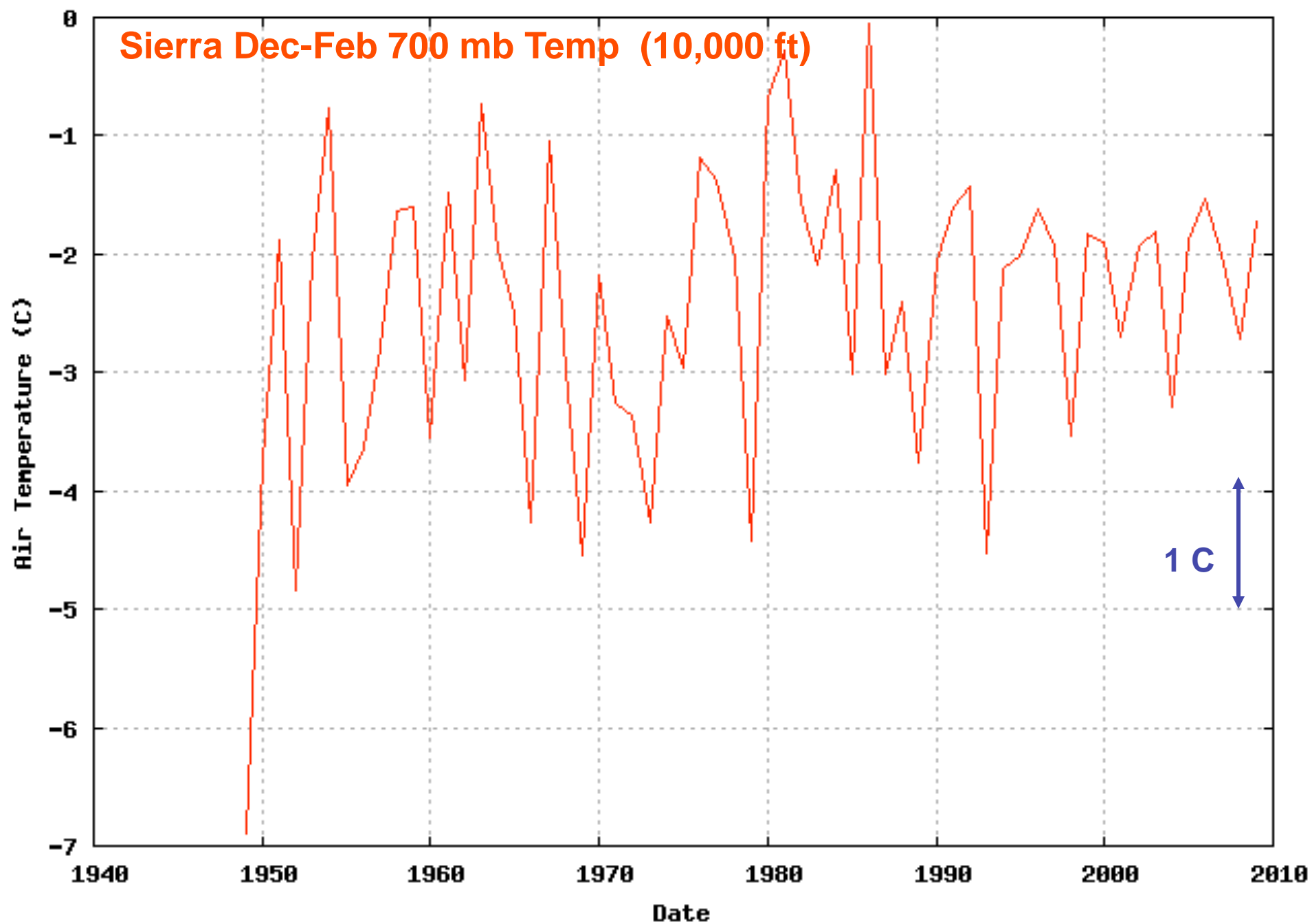
Summer



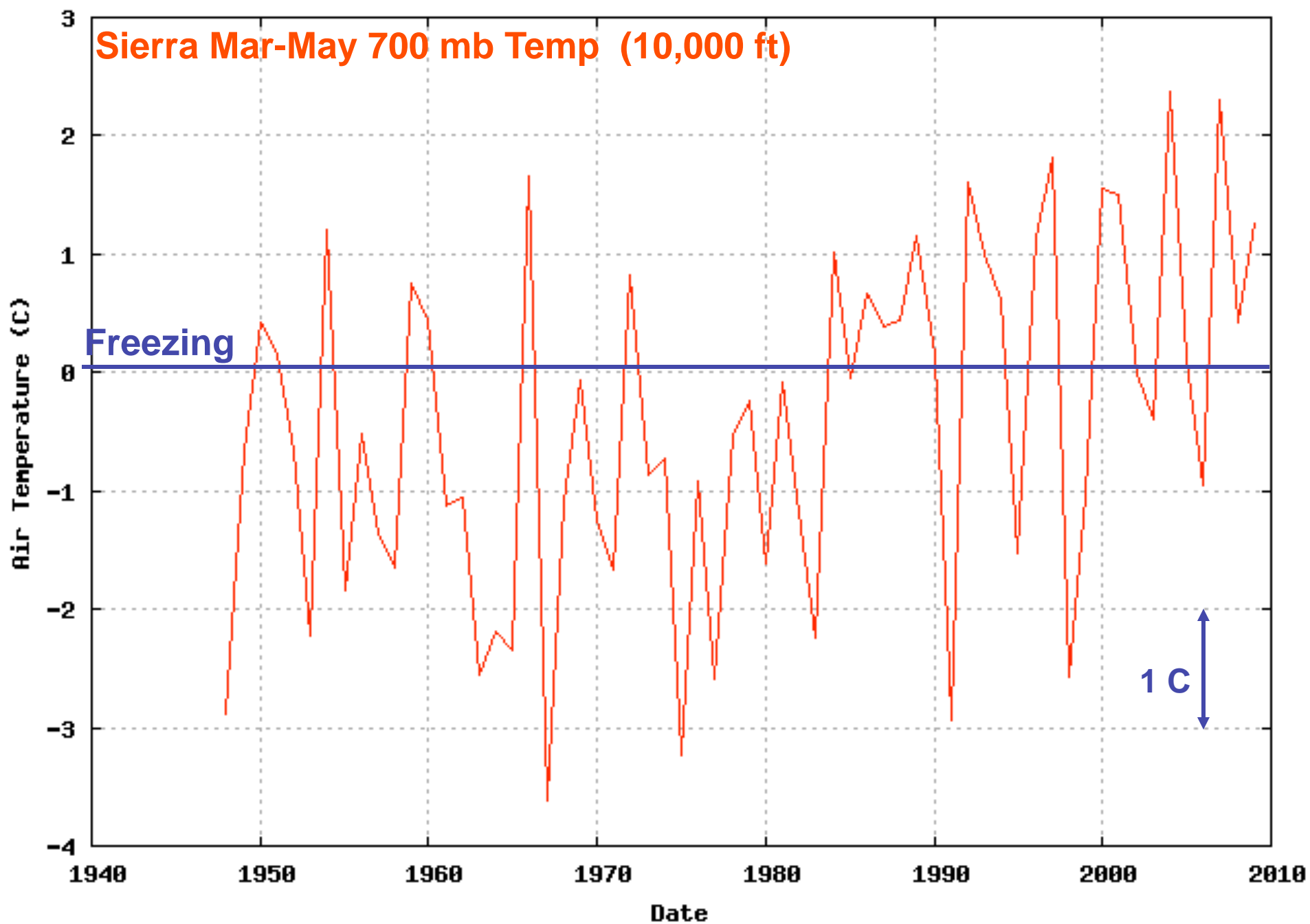
Autumn



Air Temperature (NCEP Reanalysis) Dec to Feb:39N to 36N and -120.5W to -119W averaged

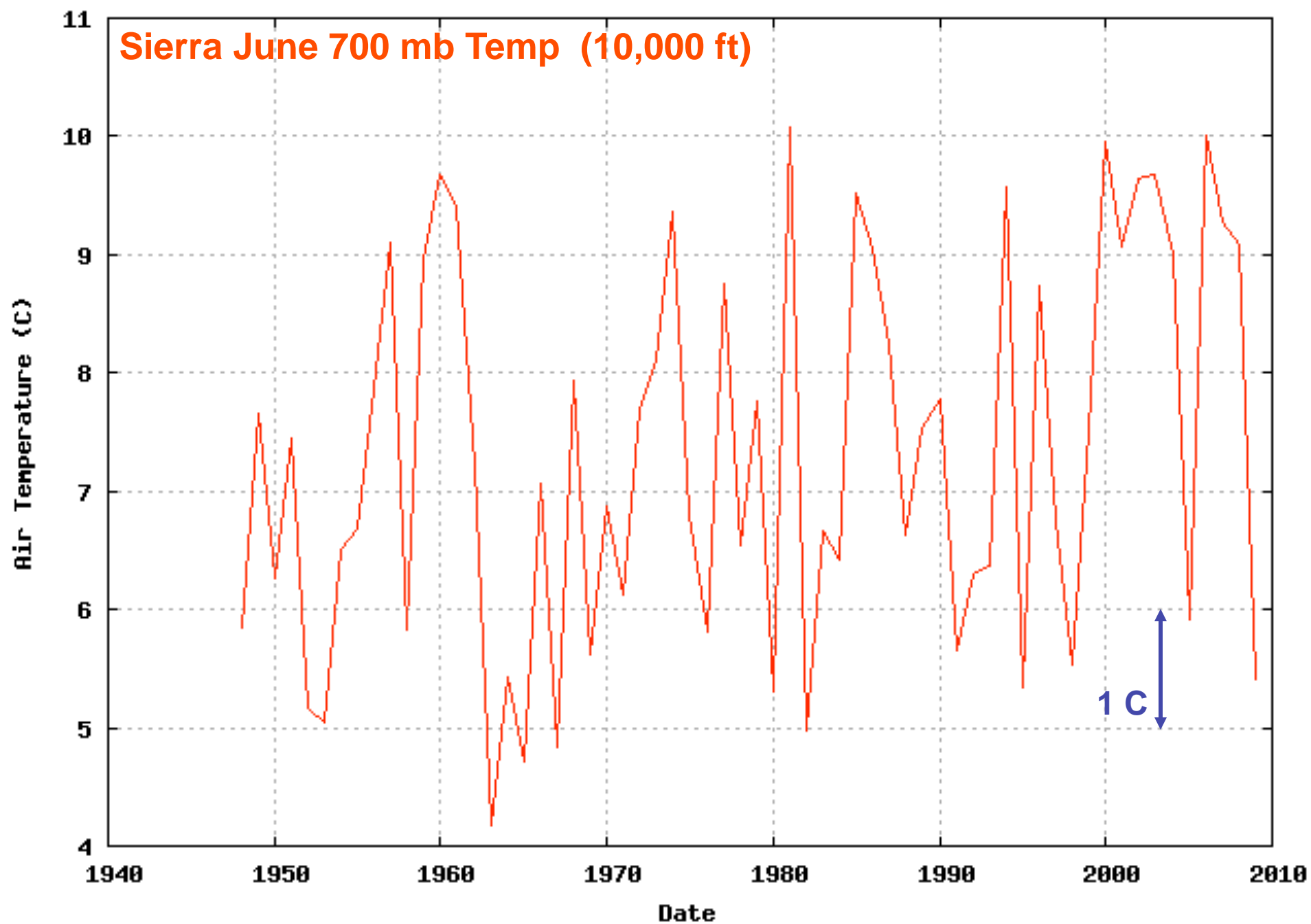


Air Temperature (NCEP Reanalysis) Mar to May:39N to 36N and -120.5W to -119W averaged

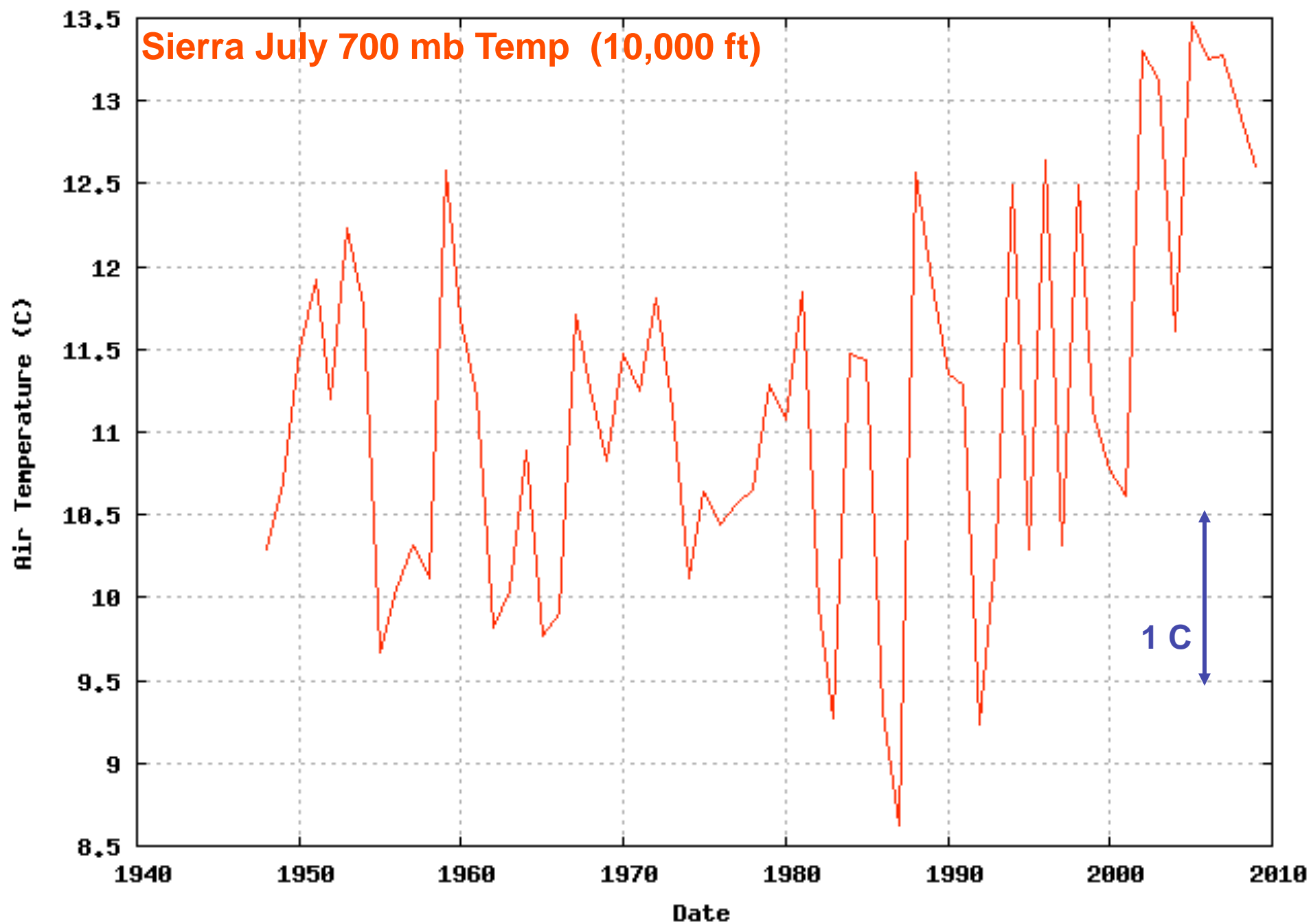


Air Temperature (NCEP Reanalysis) Jun:39N to 36N and -120.5W to -119W

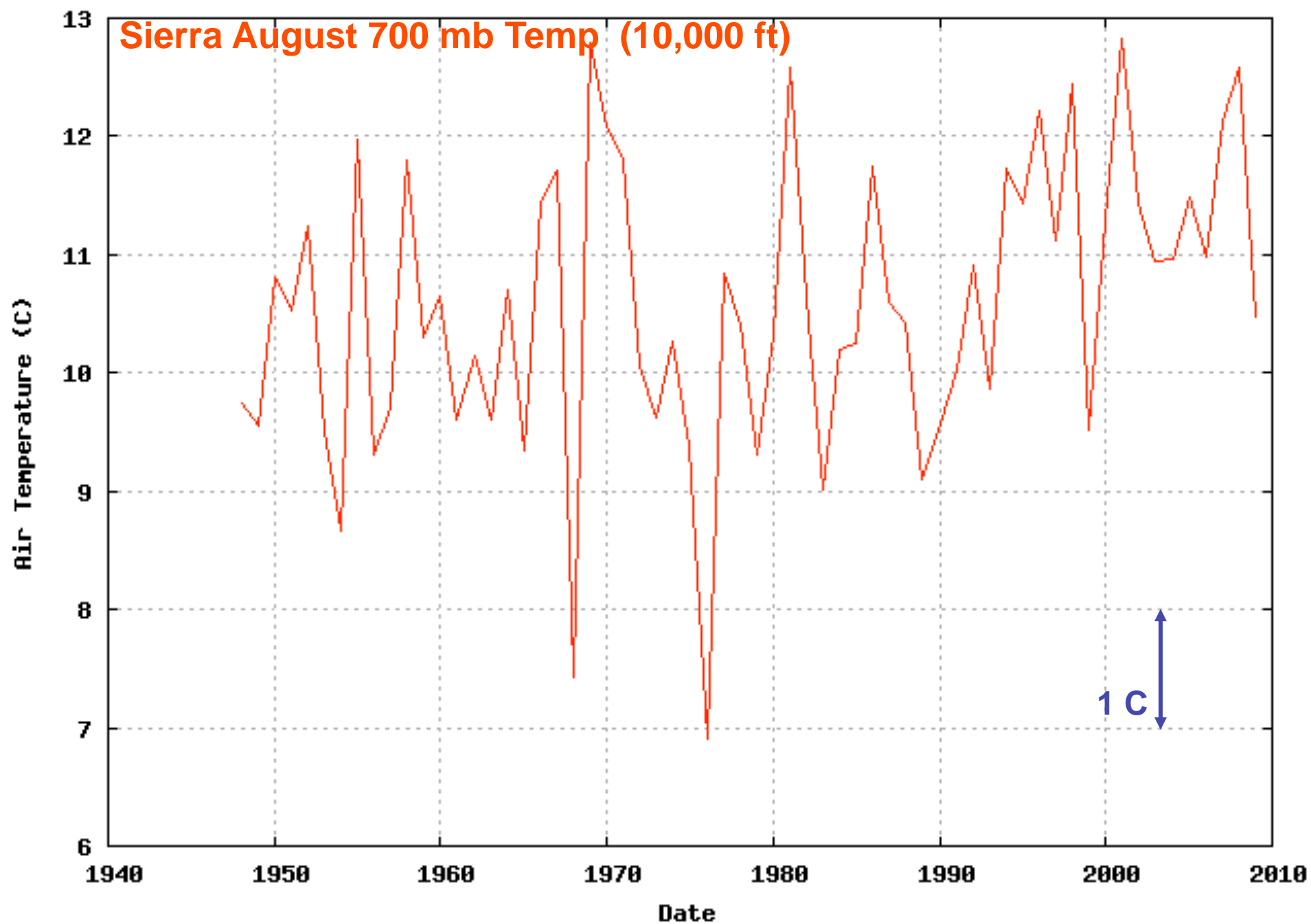
Sierra June 700 mb Temp (10,000 ft)



Air Temperature (NCEP Reanalysis) Jul:39N to 36N and -120.5W to -119W

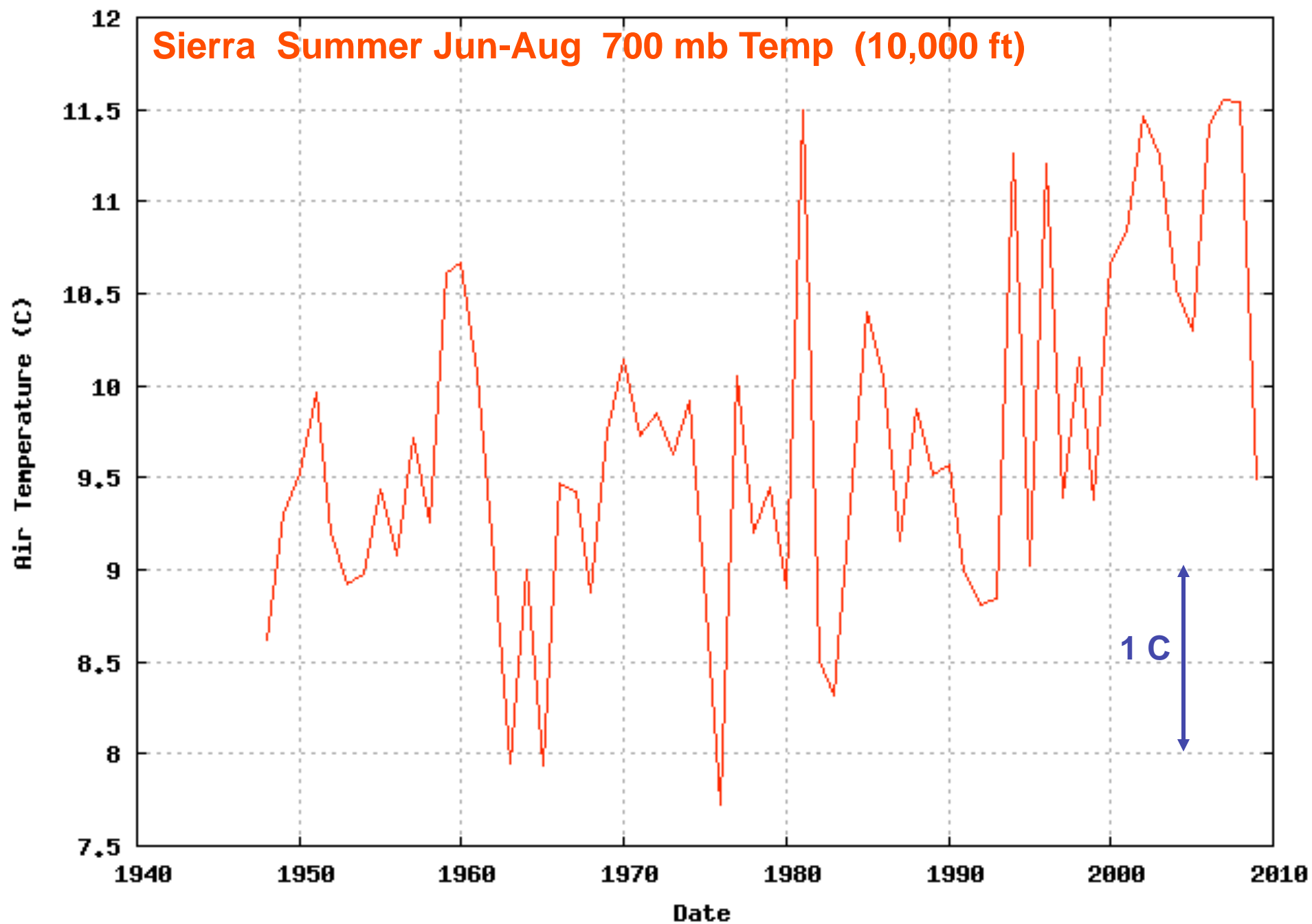


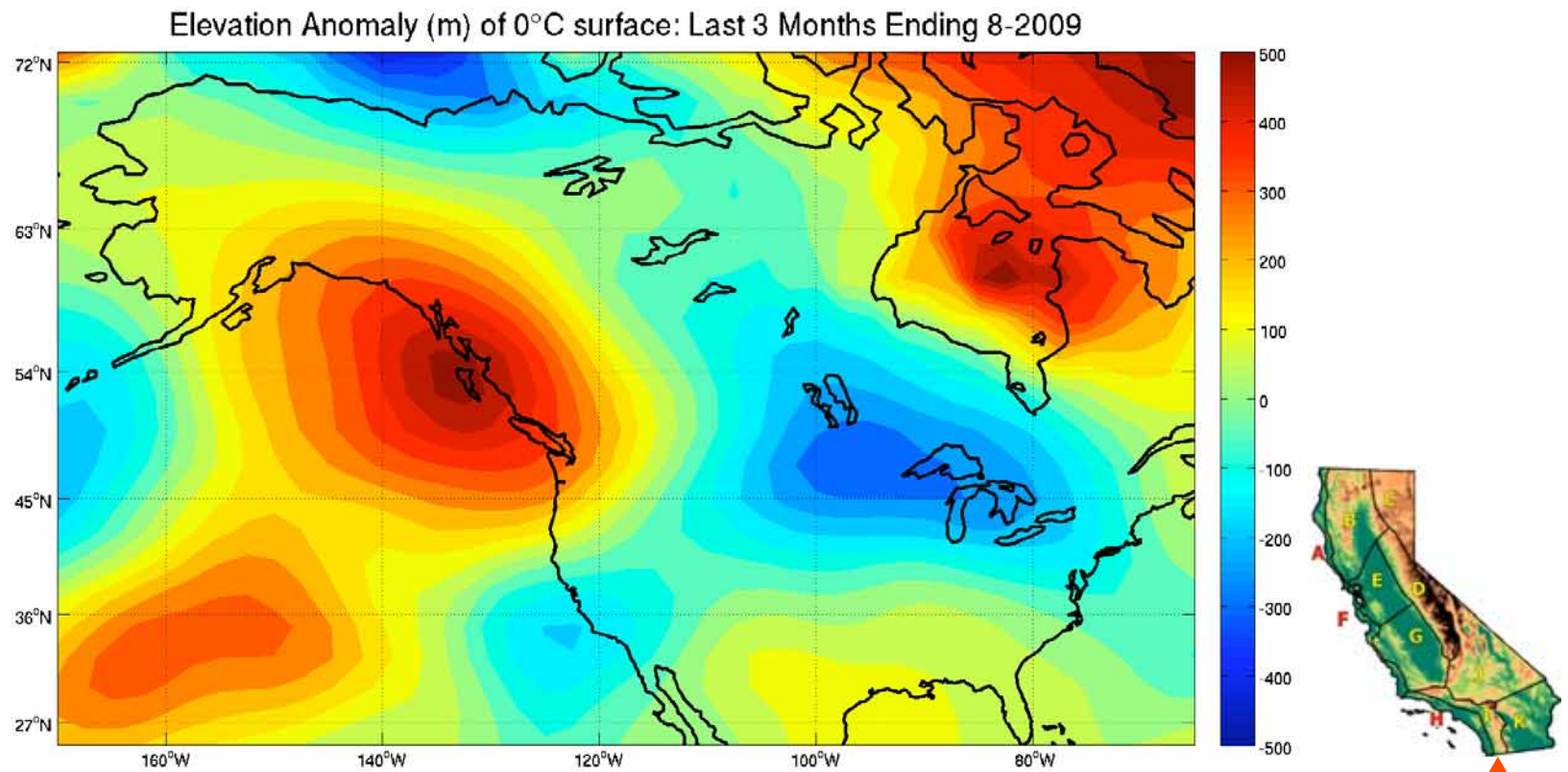
Air Temperature (NCEP Reanalysis) Aug:39N to 36N and -120.5W to -119W



Air Temperature (NCEP Reanalysis) Jun to Aug:39N to 36N and -120.5W to -119W averaged

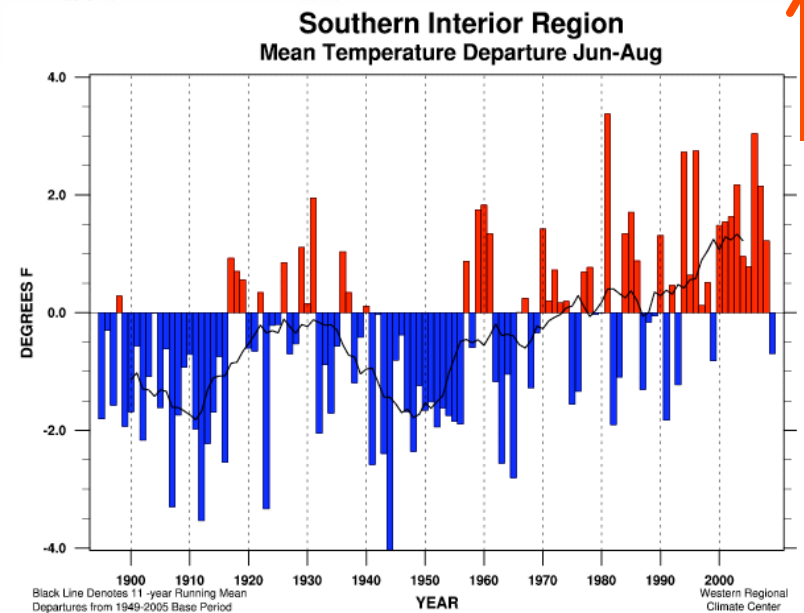
Sierra Summer Jun-Aug 700 mb Temp (10,000 ft)

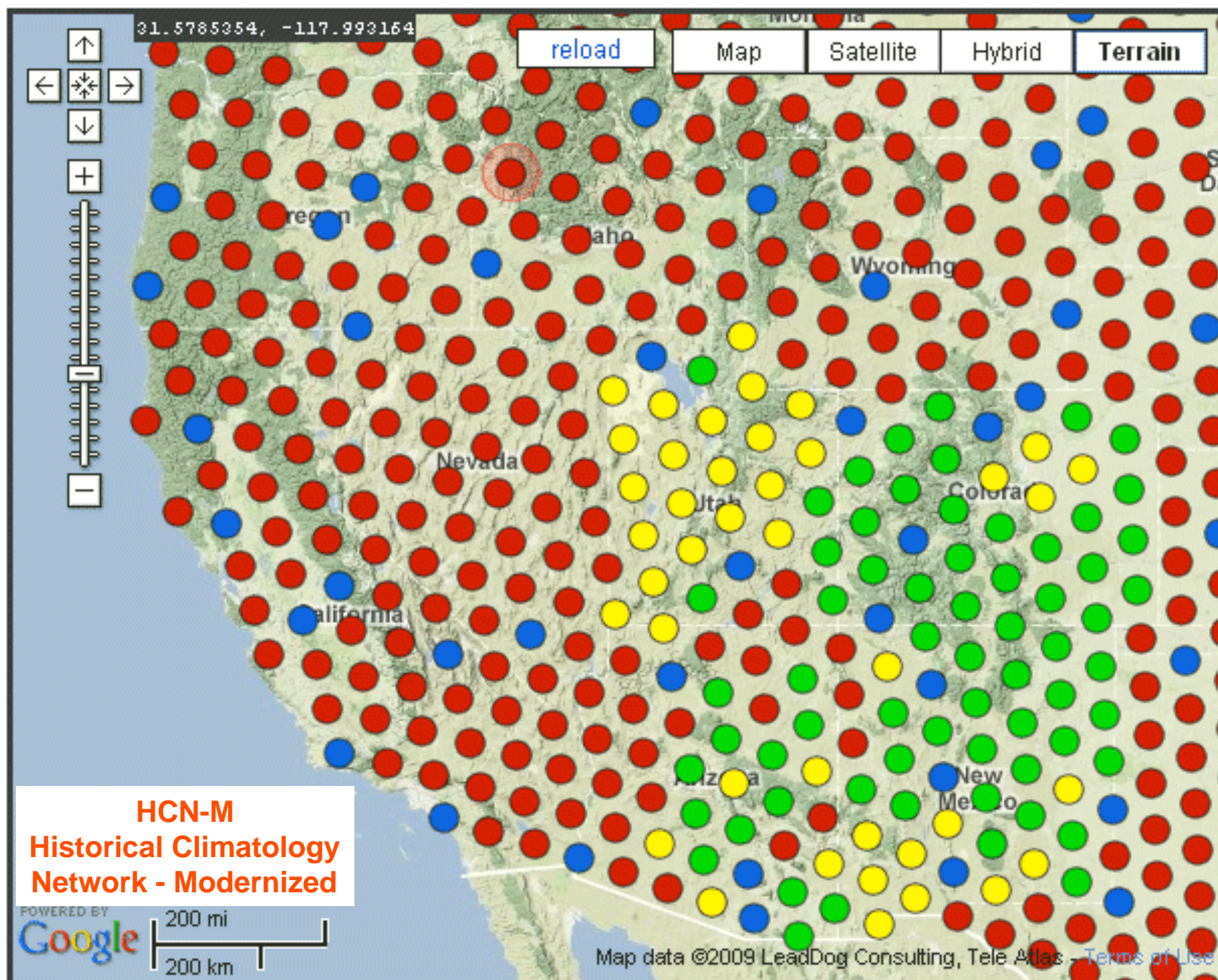




**Summer 2009 (JJA) Freezing Level
Departure From Average
(ctsy John Abatzoglou)**

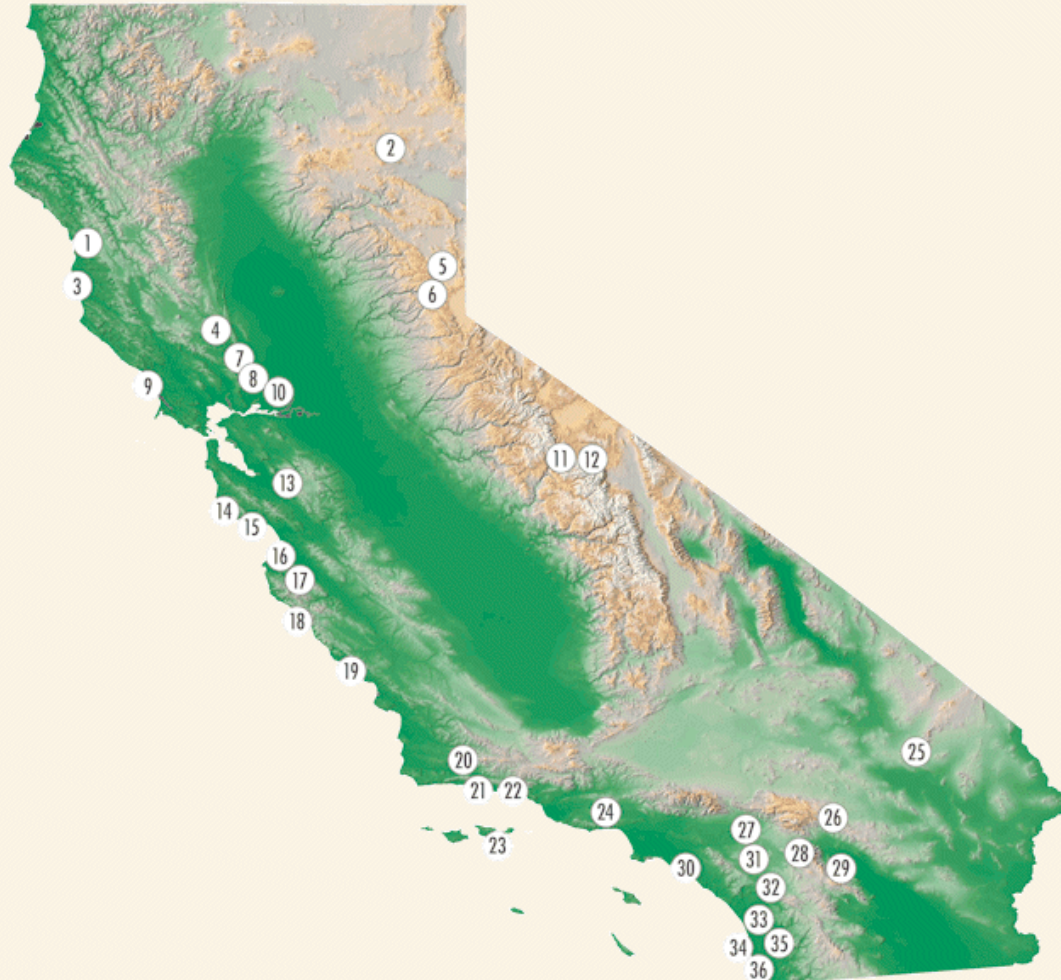
**Southern Interior Summer 2009
(JJA) Mean Temperature Departure
1895-2009**





NRS RESERVES

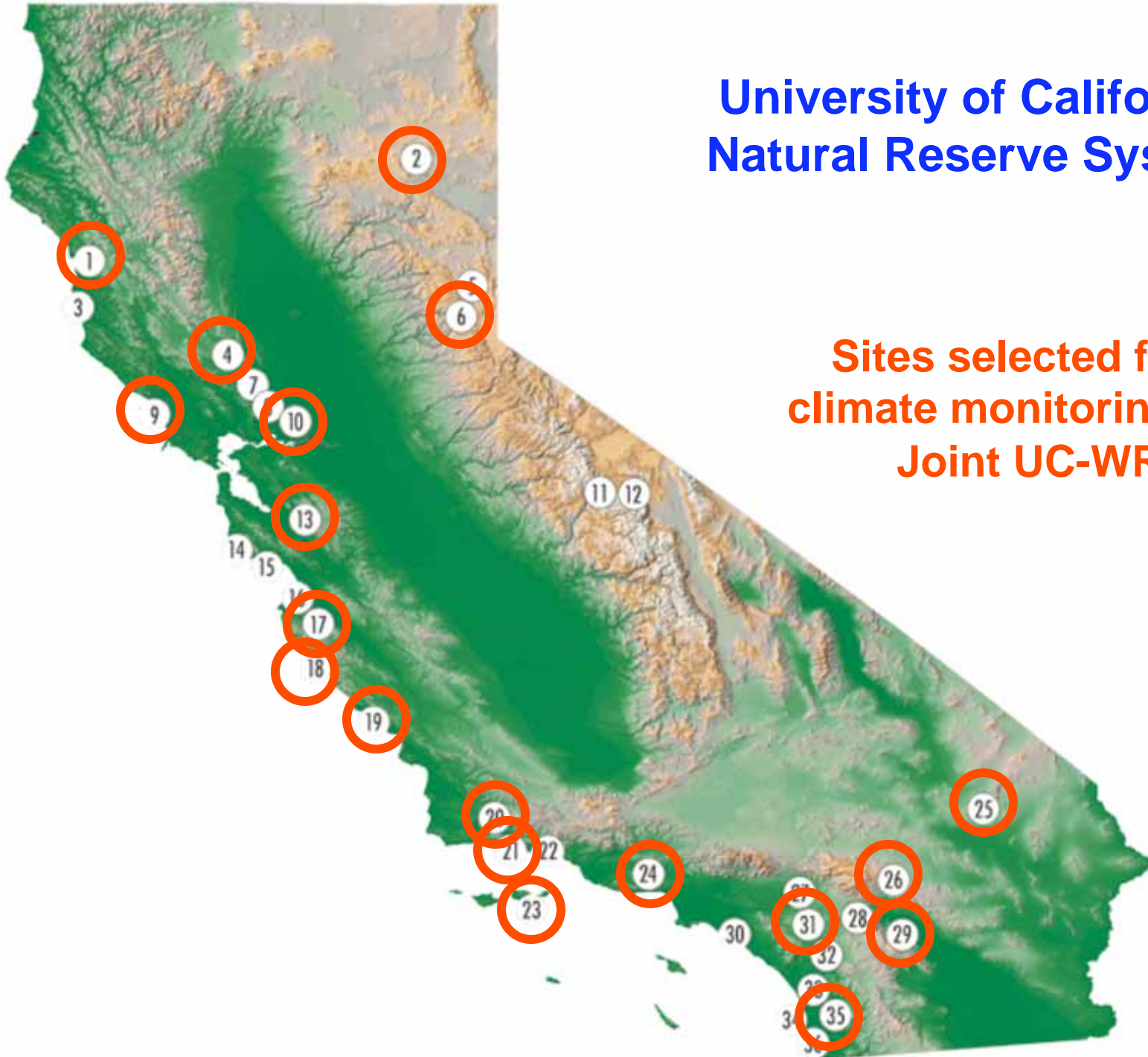
• Angelo Coast Range Reserve*	1
• Año Nuevo Island Reserve*	14
• Blue Oak Ranch Reserve	13
• Bodega Marine Reserve	9
• Box Springs Reserve	27
• Boyd Deep Canyon Desert Research Center	29
• Burns Piñon Ridge Reserve	26
• Carpinteria Salt Marsh Reserve	22
• Chickering American River Reserve	6
• Coal Oil Point Natural Reserve	21
• Dawson Los Monos Canyon Reserve	33
• Eagle Lake Field Station	2
• Elliott Chaparral Reserve	35
• Emerson Oaks Reserve*	32
• Fort Ord Natural Reserve	16
• Hastings Natural History Reservation	17
• James San Jacinto Mountains Reserve*	28
• Jenny Pygmy Forest Reserve*	3
• Jepson Prairie Reserve*	10
• Kendall-Frost Mission Bay Marsh Reserve	36
• Landels-Hill Big Creek Reserve*	18
• McLaughlin Natural Reserve	4
• Motte Rimrock Reserve	31
• Kenneth S. Norris Rancho Marino Reserve	19
• Quail Ridge Reserve	7
• Sagehen Creek Field Station	5
• San Joaquin Freshwater Marsh Reserve	30
• Santa Cruz Island Reserve*	23
• Scripps Coastal Reserve	34
• Sedgwick Reserve	20
• Sierra Nevada Aquatic Research Laboratory (SNARL) / Valentine Eastern Sierra Reserve	12
• Stebbins Cold Canyon Reserve	8
• Stunt Ranch Santa Monica Mountains Reserve	24
• Sweeney Granite Mountains Desert Research Center	25
• Valentine Camp / Valentine Eastern Sierra Reserve	11
• Younger Lagoon Reserve	15



University of California Natural Reserve System

University of California Natural Reserve System

Sites selected for NSF
climate monitoring project
Joint UC-WRCC



Conclusions

Need to monitor at the scales that matter

Need to sample all major biomes

Extra emphasis where spatial gradients are sharp

Monitoring of human-altered and “natural” settings

We need to be able to distinguish

For climate change,

The link between monitoring and issue credibility is strong.

Especially true with prediction of a never-seen phenomenon

Decadal variability

Takes careful and consistent measurements

Need to distinguish from “climate change”

Need to make and keep commitments to monitoring

... Despite other temptations !

Thank You

